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WILLIAM S. FOWLER

After fifteen years of research, commencing in 1946, during which seven sites were excavated by members of the Narragansett Archaeological Society of Rhode Island and the Massachusetts Archaeological Society, much evidence of a provocative nature has been revealed. These sites are located in the Narragansett Bay drainage, with five lying in Rhode Island, and two just over the line in Massachusetts. Because of their existence within the same general area, located on streams which empty into Narragansett Bay, it is not strange that evidence from them should disclose certain significant related features (Fig. 1). It is the purpose of this report to inquire into the meaning of certain geologic and archaeologic manifestations exposed by this evidence in an effort to learn more about conditions surrounding aboriginal occupations, and the part natural environment had to play, as related to the archaeology of the sites.

While there is no way now, and probably never will be, of arriving at the exact truth concerning the prehistory of this or any other area, still, there is much that can be done to effect more logical reasoning, in order to refine our understanding of it. One way to attain this end is through personal experience of the investigator in uncovering the evidence from which his written deductions are made, not as is often done, through his review of scientific reports concerning research in which he has taken no active part. In developing the postulations outlined herein, the writer has based his evaluations upon intimate participation in the work of controlled excavation at the seven sites being examined. Therefore, he is not dependent upon the statements of others for his conclusions, but upon his own observations of recovered evidence. It would seem that such unified effort, when pursued in an honest and rational way, should contribute to more logical results in an effort to approach a better understanding of prehistoric times.

The sites selected for study consist of four, on or near the present shore of Narragansett Bay, and three others located above tidewater in the uplands of this drainage area. The first group of bay sites includes: Potter Pond, Green Point, Sweet-Meadow Brook, and Locust Spring, all excavated by the Narragansett Archaeological Society of Rhode Island. The second group of upland sites is composed of: Twin Rivers — on West River in Rhode Island,

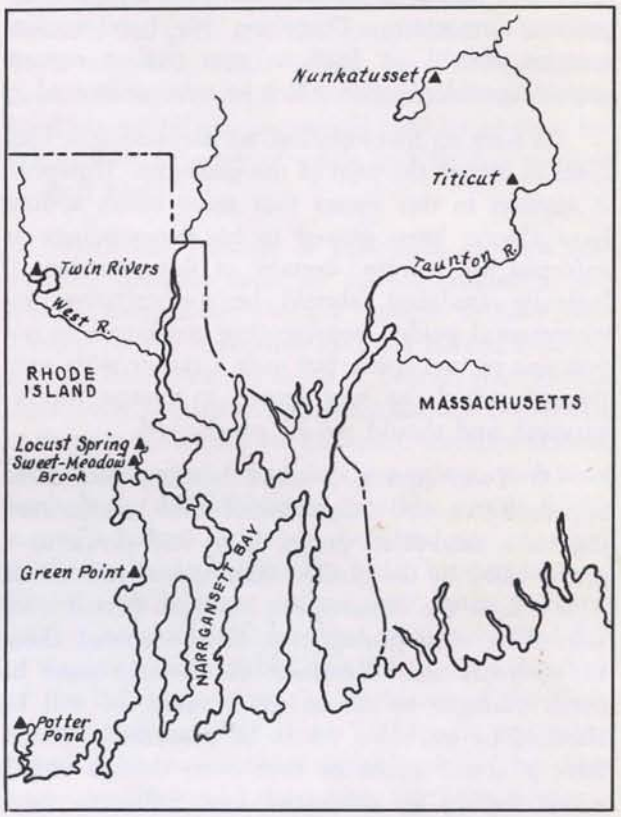

Fig. 1. NARRAGANSETT BAY DRAINAGE, showing approximate location of the seven sites referred to in text.

excavated by the Narragansett Archaeological Society, Titicut — on the Taunton River, and Nunkatusset — on a small tributary of it at the outlet of Nippenicket Lake, both excavated by members of the Massachusetts Archaeological Society. Four other related sites, Wapanucket 6, Bull Brook, Oaklawn steatite quarry, and Ragged Mountain steatite quarry will be referred to for pertinent connected evidence.

The three upland sites exhibit at their lowest artifact levels pronounced evidence of early post glacial times, and it seems only natural that they should be examined first. For what took place in the beginning concerning man's occupation of any given area is of paramount importance as a basis of discussion about the culture periods that followed. In considering what these sites may tell us about man's first invasion of this region, it is equally important that attention be paid to any implications they may suggest concerning environmental conditions that existed at the time of his entry. In order to accomplish this end, this paper proposes to consider not only the archaeological significance of man's earliest artifacts at these sites as they may be

related to his activities and mode of living, but also a study of them as to what they may imply concerning his natural surroundings at the time of their deposition. For man through the ages has accommodated himself to his environment through independent invention. Therefore, his hand-worked remains should, at least in part, reflect nature-imposed problems with which he was confronted.

In such an investigation, an archaeologist may seem to invade the field of the geologist. However, it appears to this writer that since man's actions have always been geared to his surroundings as enforced by nature, certain of his remains, if logically analyzed, should be authoritative environmental guides, representing conditions in not just one or two spots, but over a rather wide area through which he was forced to forage for his survival, and should not be overlooked.

At Twin Rivers, a small hunting site, there appeared two well defined small stone hearths resting on a sand-filled gravel floor, laid down as a gravel kame by the glacier when it retreated north. This was at the close of the Mankato period, considered by most geologists to have occurred about 11,000 years ago. However, the hearths must be much younger by about 4,000 years, as will be clarified by evidence yet to be presented. Therefore, it seems probable that even though strong winds during an estimated four millennia must have swept over the site's gravel floor, they left but a light covering of sand; only such as became imbedded in the gravel. There could not have been a heavy sand deposit reaching up to present levels, as is held by some geologists, at least at this site. Had this occurred the later day occupants would have been obliged to dig holes through sand up to 20″ in depth in order to place their hearths and other artifacts on the gravel floor; a preposterous assumption and contrary to human behavior in building hearths, and in discarding unwanted artifacts.

Due to a hummucky gravel base, these hearths varied in depth, the deeper of the two lying 20″ below grass roots. They were constructed with a single ring of cobbles surrounding a small fire pit up to about 6 x 10″ in size, with an opening left in one side, apparently for feeding fuel (Fig. 2). Charcoal remains were non-existent, indicating temporary occupancy, perhaps during a short summer season. A fluted point made of local quartzite with reworked parallel sides, one slightly ground, extending ¾″ up from its basal points, was recovered just above the sand-gravel level (Fig. 4, #1). It is believed associated with the hearths, thereby implying for them, presumably, a late Paleo-American origin, representing, probably, a culture that was merging with the first of the Early Archaics.

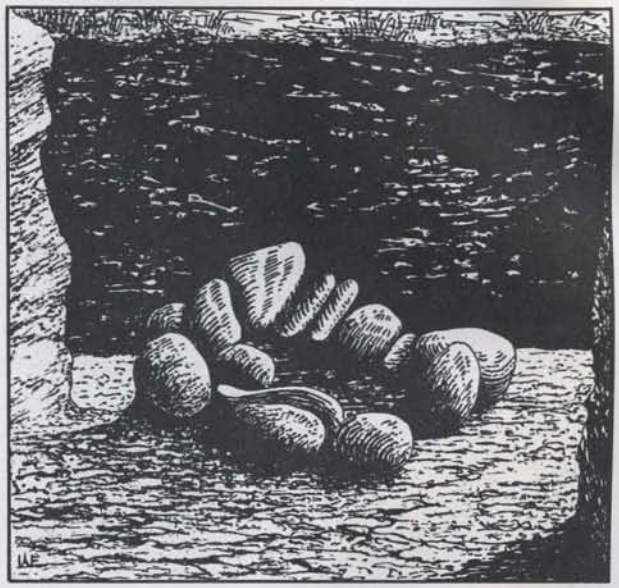

Fig. 2. LATE PALEO HEARTH, Twin Rivers.

At Titicut, lying 3 to 5 feet deep on white dune sand, once the bed of an extensive ice age inland lake, appeared eight small stone hearths of a similar kind to those at Twin Rivers, except here they assumed slightly larger proportions with fire pits up to 9 x 15″ in size, and showed signs of having been used more extensively (Fig. 3). Some contained much charcoal, suggesting use over longer seasonal periods than at Twin Rivers. Parts of the fuel were not fully consumed, which in no case represented

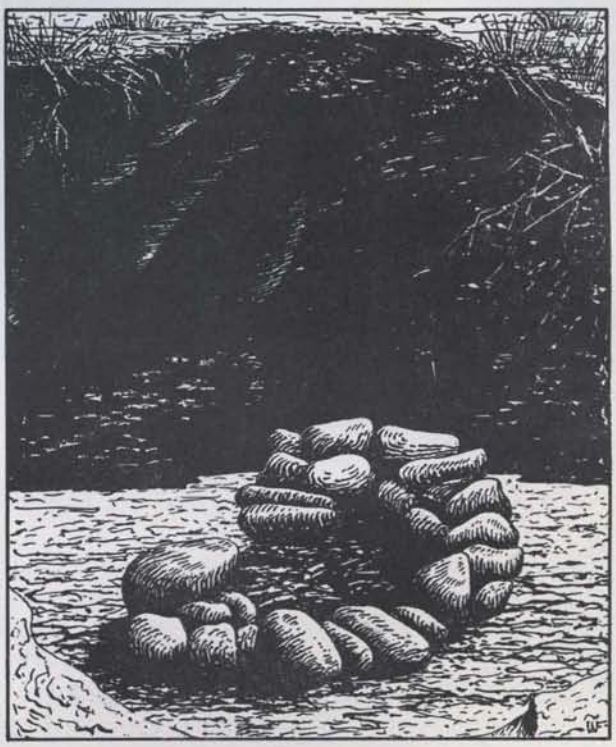

Fig. 3. EARLY ARCHAIC HEARTH, Titicut.

sticks of more than ½" in diameter, suggestive of a bushy tundra environment. Unlike Twin Rivers, no fluted point occurred to connect these hearths with Paleo times, although an extensive area was excavated. Instead, certain projectile point types of Early Archaic days appeared (Fig. 4, #2-6). At this site two charcoal samples, taken by Frederick Johnson from an open hearth on the same white sand level with the small stone hearths, produced Carbon-14 dates of 4,139 ± 260 and 5,750 ± 720 years ago. The excessive discrepancy between these two dates suggests probable recent contamination of the younger one, with more reliance being placed on the older. Considering the extreme error correction of this earlier date, it seems preferable to utilize the maximum permitted, with a result in round numbers of about 6,500 years ago.

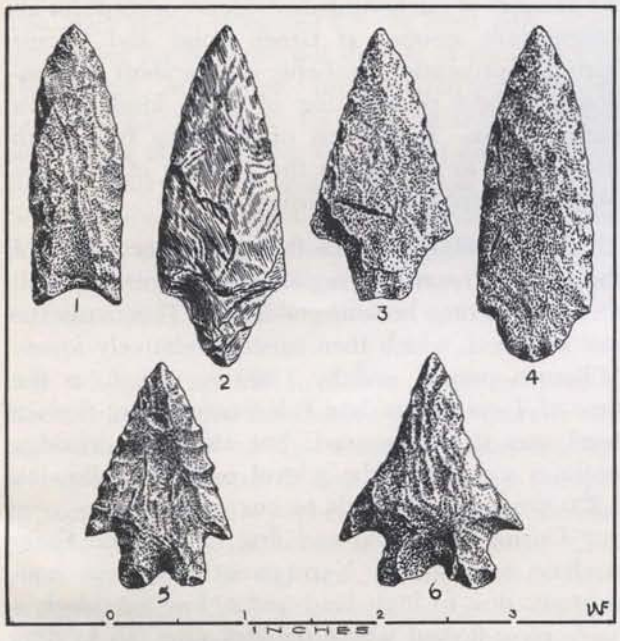

Fig. 4. PALEO AND EARLY ARCHAIC POINTS. 1, Fluted (Twin Rivers, Paleo); 2, Corner-removed #8; 3, Corner-removed #5 (Twin Rivers); 4, Corner-removed, #9; 5, 6, Bifurcated (5, Titicut; 6, Nunkatusset; 2-6, Early Archaic).

At Bull Brook, a tidewater site in Ipswich, Massachusetts, more than 100 perfect or near-perfect fluted points made of various kinds of flint were recovered from a low hard packed coarse sand floor, 10 to 15" below loam, exposing at that level a relatively undisturbed Paleo-American site. Here, however, no unique stone hearths appeared like those at Twin Rivers; only open fires apparently were used by the occupants. Of three charcoal samples representing this low level, the one taken by W. A. Eldridge — most reliable — produced a Carbon-14 date of about 9,000 years ago.

From this review of site evidence so far, it seems evident that Paleo man first arrived in New England, probably by dugout canoe, some 9,000 years ago. He brought with him flint material, from which he chipped out his fluted points; no known source of chert exists in this New England area, which produces such highly varied flint stock as that at Bull Brook. Its flint colors include, black, maroon, tan, gray, and changing shades of all four. Some are dull, while others have a high gloss, doubtless representing more than one source. The local glacial till has occasional cobbles of flint, but not in such an array of colors and finishes as those at Bull Brook.

With the passage of millennia, modern cold weather animals such as caribou replaced prehistoric mammoths, and are thought to have been hunted by the occupants at Twin Rivers, and at a slightly later date, by those at Titicut; their similar small early hearths should place the first occupation of these two sites not too far apart. Caribou skeletal remains reported found in Connecticut, and more recently in Massachusetts provide proof of this animal's former existence here as one of man's quarries. Evidently, the late Paleo hunters at Twin Rivers were by then making their fluted points of local stone materials, for there was no worked flint at the site. Presumably, this was toward the close of the Paleo era, or at the beginning of the Early Archaic, estimated at about 7,000 years ago, when fluted points were about to be replaced by other types; no Carbon-14 date exists for Twin Rivers.

The occupants of this site, as well as those at Titicut some 500 years later, devised unique stone hearths, as illustrated, seemingly meant for burning small sticks and brush; apparently larger wood was not available in the area frequented by these nomadic hunters. For, if trees had forestated the countryside, there would have been fuel procurable in the form of dead or broken branches from fallen trees, to say nothing of slash from trees laboriously felled by fire and stone ax for dugout manufacture. For such fuel, hearths with small fire pits would have been useless. Therefore, it must be concluded that instead of forests, a bushy tundra existed upon which caribou and other hunted animals fed. Apparently this condition had persisted for a long time after retreat of the ice, for at Titicut the small stone hearths with stick fuel in evidence were in use as late as 6,500 years ago.

Unfortunately this archaeologic interpretation is in conflict with the geologic description of early post glacial times. Some geologists hold that spruce began to grow soon after retreat of the ice, and Deevey believes a high-pine zone existed at about 8,500 years ago in Connecticut and 6,000 years in Maine. These are Carbon-14 dates from measures

of pollen samples taken in cores from the center of two ponds, one in Connecticut, the other in Maine. Obviously they represent vegetation of only low, wet areas, and cover but two isolated spots. From such limited evidence, it seems highly speculative to infer that similar vegetative cover was widespread over these areas. Even if many more geologic samples were to be measured from other points, as they may well be in time, still any such sporadic geologic testing could never represent as broad an era as that covered by nomadic hunters like those at Twin Rivers and Titicut. The bushy tundra suggested by their unique stone hearths doubtless was extensive as hypothesized, but that does not rule out the possibility that a few pines or other trees may have existed in some low-lying valleys. Even then, such trees might well have been stunted without fully developed tree growths. Doubtless this would have precluded their usefulness as suppliers of large sized fuel to contemporaneous hunters.

Deevey accepts the thermal maximum—a warm period, sometimes referred to as climatic optimum — as occurring about 5,500 years ago, while Fairbridge envisions it slightly earlier. Therefore, this climatic change to much warmer weather appears to have taken place about a thousand years after Titicut's small hearth occupation. And during this time with the arrival of warmer weather — a stimulant to growth — trees could have become more numerous and larger in size. Nevertheless, in spite of this, a bushy tundra evidently persisted in certain areas of the uplands, where wind and drifting sand may have prevented, to a large extent, accumulation of humus sufficient for tree growth over a prolonged period of time.

Let us now consider further site evidence before arrival of the thermal maximum, and see what else may have taken place. At Nunkatusset, several miles up stream from Titicut, evidence at its lowest level on yellow sand reveals an occupation of Early Archaic hunters, who left as markers certain projectile point types: Corner-removed #5,8,9; and Bifurcated (Fig. 4, #2-6). These important diagnostic traits are also present at Titicut in the Early Archaic zone starting at its small hearth level, as previously indicated, and, except for the Bifurcated type, at Twin Rivers in its Early Archaic zone. Another important indicator of this early age, the Ulu (ground slate knife) appears first undisturbed in this zone at Titicut and Nunkatusset; is out of context at Twin Rivers. Titicut, alone, of these three upland sites, provides a radiocarbon date for this early Archaic Age of about 6,500 years ago, as previously mentioned. This, or a somewhat earlier date, is thought to represent the beginning of the era, well before arrival of the thermal maximum. During this culture period's estimated duration of about 1,500 years, bushy tundra may have lasted for most of the time, as has been suggested, with caribou hunting the chief activity. It is thought likely that presence of the Bifurcated type blade with its sharp barbs at Titicut and Nunkatusset, presumed to be a harpoon point, may indicate seal hunting as another activity of those days.

So far, only the three upland sites have been examined, where possibly, the last of the Paleo-American occupation at one, but certainly the Early Archaic at all three are clearly defined. When a study is made of the remaining group of four Narragansett Bay sites, a different situation is presented. Here the lowest occupational level reveals the absence of Early Archaic evidence, except for an insignificant amount at Green Point and Locust Spring, representing probably only a short occupation or slight overlapping of some kind of this early culture. Evaluation of evidence from both site groups as related to the geology of the area suggests interesting conclusions.

Most geologists agree that soon after retreat of the ice cap from this region, the depressed earth rose, and in time became stabilized. This made the low sea level, which then existed, relatively lower. Millennia passed, and by 7,000 years ago, at the time of Twin Rivers' late Paleo occupation, the sea level was still depressed, but rising. Fairbridge outlines a rise to today's level over the following 1,200 years, which leads to our postulation.

During the Paleo and first half of the Early Archaic occupations, Narragansett Bay was nonexistent, due to high land and a low sea level; a wide river flowed where the Bay now is. As time passed, it seems probable that camps of Paleo, and later on, Early Archaic caribou hunters were made along this river, and continued there for many years. However, toward the close of the Early Archaic the rising sea level forced the river to overflow its banks, which must have driven the people from their skin huts. Most of them appear to have removed up stream above tidewater, but a few may have retreated to higher land along the river's banks. Many years passed by as the sea continued to push inland, and by the time the present shores of Narragansett Bay were formed, some 5,000 years ago, the Early Archaic occupation had come to a close, with most of the hunters having moved north pursuing the retreat of caribou and tundra; remnants may have camped for a short time at certain spots along present bay shores, as meager evidence at Green Point and Locust Spring suggests.

At about this time other events began to take place, as is evidenced by appearance at all seven sites of new artifact traits. They occur in the next higher zone of occupation — the Late Archaic — overlying that of the Early Archaic. A new tradition seems to have arrived with strong dominant tendencies, which partially absorbed, and mostly replaced old artifact traits. The most outstanding replacement forms now in evidence are certain projectile point types, which in most cases tend to be relatively broad bladed: Corner-removed #1,7; Eared #1,4,5; Side-notched #1; Tapered Stem; Small Triangular (mostly convex sides); and Small Stem (Fig. 5). Appearance of the last two types of small points are thought to represent the introduction of bow-and-arrow. From then on, this method of ejecting the shaft grew in popularity until in historic days the bow-and-arrow is found in universal use, with spears relegated for the most part to use as jabbing implements, not thrown as formerly. Of the larger implement traits, Grooved ax and Grooved gouge appear for the first time, together with Wing atlatl weight, and a great array of stone bowl quarry tools including, Pick, Abrading-Scraper, Shaver, Hand Gouge, and Chisel-Scraper. Another trait, Clumsy plummet appears as a modified adoption of the Classic plummet of the preceding age.

While at no site in either group is there a Carbon-14 date for this culture period, there is one at Wapanucket 6 on Assowampsett Lake, reached by water from Buzzards Bay. At this site, thought to represent an early aspect of the age, a charcoal sample yielded a radiocarbon date of about 4,300 years ago; start of the age is estimated to have occurred about 5,000 years ago. Since specialized tools of the stone bowl industry with quantities of bowl fragments are much in evidence toward close of the period at the bay sites, where this period merges into that of the Ceramic about A.D. 300, assumption may be valid of envisioning for it a long span of over 1,000 years. Because of this extensive industrial concentration of manufacture of bowls, platters, plates, cups and all manner of vessels of steatite, chlorite, and other kinds of stone, the period is referred to as the Stone Bowl Age (Late Archaic). Doubtless at no other time during man's occupation of prehistoric New England has there been such a force as this industrial activity to help mold the social customs of the day. Stone hearths of this age consist of an indiscriminate concentrated mass of small flat faced stones — not cobbles as in earlier days — placed as though they were intended to accommodate large sticks or logs. Small fire pits have disappeared, as though no longer useful, with the connotation that forests have arrived and are providing large sized fuel for fires.

This was an age of invention and social adaptation to new ways of living. From a nomadic hunting economy, which was dependent upon solid foods of fish and meat, there evolved one in which liquid foods became an established part of the diet, while stone bowls became a household necessity. They were the first permanent cooking vessels made in

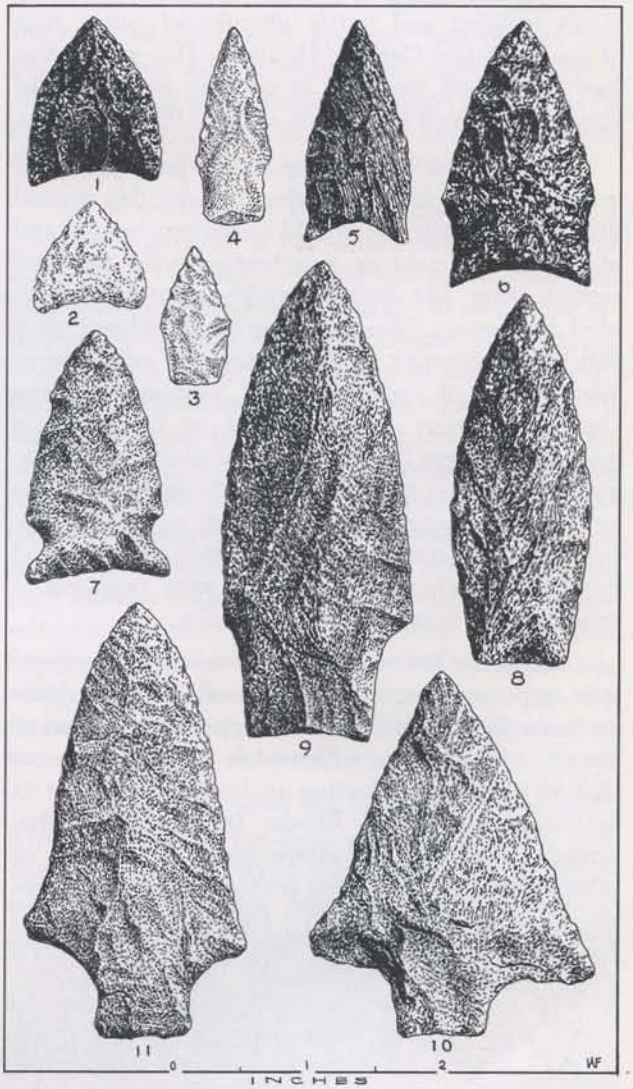

Fig. 5. LATE ARCHAIC POINTS. 1, 2, Small Triangular; 3, 4, Small Stem; 5-7, Eared #1, 4, 5; 8, Tapered Stem; 9, Corner-removed #1; 10, Corner-removed #7; 11, Side-notched #1.

the Northeast, and doubtless were the means of stretching the family larder. For the duration of this industrial age, shellfish were not eaten, as it is not until the advent of ceramics that shell remains are observed with occupational litter at all bay sites.

Having established the probability of the entry of a new virile and inventive economy with a different tradition, which in time stamped out all traces of the old, the question arises as to where its people came from. Presence of grooved axes ap-

pearing for the first time leads to the theory of a middle western source, possibly the Middle Mississippi Valley. In that locality appear grooved axes associated with the Moundbuilders of Adena and Hopewell cultures, more or less contemporaneous with late Stone Bowl times in the East. From this it might be concluded that New England's Stone Bowl Makers were nomadic pioneers, who did not tarry to build the cultures of the Middle West, but continued eastward until they reached New England's isolated and partly abandoned camp sites of the preceding Caribou Hunters. This was before they conceived the idea of pecking bowls out of stone; might well have been about 5,000 years ago.

By then, thick forestation would have prevailed with arrival of deer and other present day animal life. Narragansett Bay would have been formed and would have served as a watercourse for the new settlers, who, like earlier arrivals, must have traveled by dugout. There is reason to believe, as a substantial amount of Early Archaic evidence at Wapanucket 6 indicates, that remnants of the Caribou Hunters stayed behind as fishermen at good fishing sites like this one and merged with the newcomers. But the persistent driving force of the new settlers apparently was too much for the former occupants, and in time their customs and implement traits were forgotten; were replaced or modified by those of the new order.

Sometime before termination of the Stone Bowl Age, pipe smoking was introduced, and the quarriers commenced making three types of pipes out of steatite and chlorite, with which they had become skilled in the manufacture of bowls. Evidence at Oaklawn quarry in Rhode Island shows that straight, platform, and elbow pipes were made, of which the latter two were preferred and were produced in greater quantity. Excavated remains at bay sites reveal that not only pipes of moderate proportions were laboriously pecked, reamed, drilled, scraped and polished from stone, but small ones of no more than 2″ in length were expertly achieved.

Excavation at the sites of both groups reveals the start of a fourth and last culture zone overlying that of the Late Archaic industrial era. It is identified by either the appearance of Stage 1 potsherds (cord-marked both sides, with coarse mineral temper), shell refuse from shellfish eating, Triangular hoe and Large Triangular point traits, or any combination of these features depending upon the site being studied. Of all these diagnostics, the one that set its stamp most upon this age was that of ceramics. Proven by stratified remains at Ragged Mountain steatite quarry in Connecticut, it is clear that pottery making replaced probable male dominated stone bowl manufacture, thereby releasing new economic forces. These were set in motion by female industrial labor; it is probable that women became the potters, or they would not have developed the skill, which made them potters in colonial times. They now commenced to influence a new culture society built around their thriving new occupation of pottery making; an industrial revolution had taken place. This is the Ceramic Age (Woodland), and it had only just begun about A.D. 300 when it received an economic transfusion of another sort. This was the growing of maize, an activity which was introduced after a long diffusion, probably across the continent from the Southwest. Perhaps the best indicator of its arrival is the presence in this horizon at all bay sites of the Triangular hoe trait, first encountered at the Stage 1 pottery level. This type of hoe blade has been proven to have been a popular agricultural implement (see writer's report: "Did Lafitau Draw What He Saw?"). This evidence suggests that toward the beginning of the age women took on the duties of husbanding maize, and added this work to that of pottery making; they were the planters in colonial days, as reported by early commentators, and therefore probably were from the start.

By this time, shellfish were being gathered and added to the diet. At all bay sites, with shellfish beds in easy reach, shell refuse first appears with Stage 1 potsherds; is not present in earlier horizons at these sites or at any others. Important diagnostic traits of this Ceramic Age are: Large Triangular, Small Triangular (straight to concave sides), and Corner-notched points; Triangular hoe; Crescent drill; and Sinewstone (Fig. 6). They have appeared, consistently, at these sites in their uppermost culture zone.

During this age warfare started and grew in intensity, otherwise the Indians of colonial days would not have practiced cruelties of torture, as they did, not only upon their white captives, but also upon those of their own race. As evidence of this, the War-Club Prong appears as a distinguishing trait in this last culture horizon at several of the bay sites; not in earlier horizons. Referred to by early commentators as in use in their day, such a prong set in the end of a club was called a tomahawk by one early writer. This evidence seems to point to the advent of warfare with the coming of ceramics. At Sweet-Meadow Brook there was evidence in the method of burials during this age, which suggests that warfare had caused a culture decline. Toward the middle of the period burials lacked grave goods, which had been there for-

merly. From then on some bodies were dumped like any waste into refuse pits, apparently with no respect being shown for the dead; a spiritual decline had set in.

Development of ceramics during this last culture period went through four stages of change. The first three are in evidence at Sweet-Meadow Brook and Locust Spring, the first two only at Green Point, while all four are at Potter Pond. The most significant changes that took place seem to have followed a natural sequential course of development. Conoidal based pots first appear in Stage 1, as a decided departure from flat bottomed stone

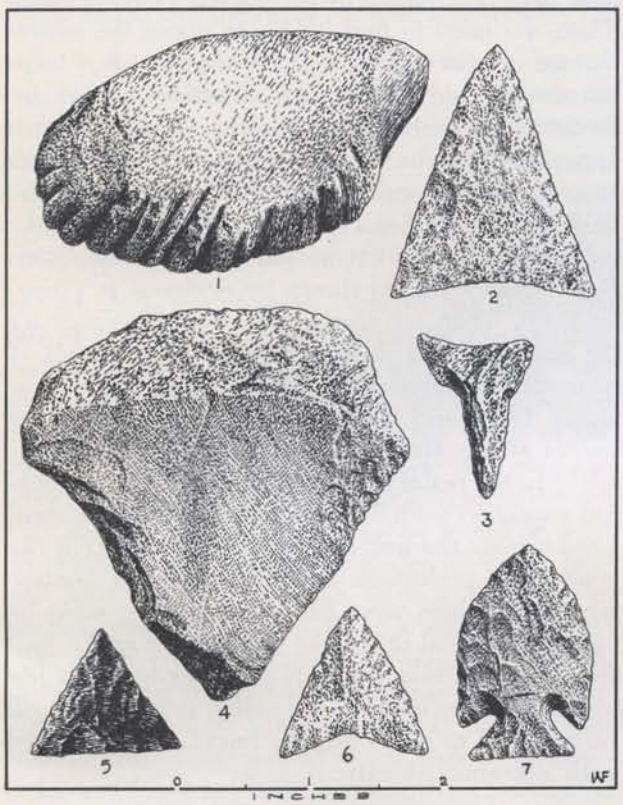

Fig. 6. CERAMIC ARTIFACTS. 1, Sinewstone; 2, Large Triangular Point; 3, Crescent Drill; 4, Triangular Hoe; 5, 6, Small Triangular Point; 7, Corner-notched Point.

bowls. Comparing this first ceramic pot shape with that in Pennsylvania, New Jersey and Long Island, a marked difference is noticeable. In those outlying regions earliest pots have flat bottoms, and in some cases, even lugs like stone bowls. Evidently, the Stone Bowl tradition in those areas resisted change to the new conoidal shape as prescribed by the new pottery tradition, thought to have diffused into North America from Asia. However, by the time it reached New England, probably by way of Long Island, the experimental period had ended in which conoidal based pots were found to be less susceptible to fire cracking than flat bottomed ones; second stage pots in the outlying regions are conoidal in shape like Stage 1 pots of New England.

Evidence from all bay sites indicates the chief weakness of Stage 1 pots lay in the ineffective joining together of clay coils; breakage is often along the coils, which tend to separate. Paddling both sides of the pot's walls with cord-wrapped paddles served as the preferred treatment to help bind coils together for the duration of this first period, which may have lasted for about 700 years. Also, coarse mineral temper was used as a paste binder. As shown by evidence at Sweet-Meadow Brook toward the close of the period, crushed shell temper was experimented with unsuccessfully, with a return to coarse mineral. Also, elemental design treatments on the vessel's neck near the rim were attempted at this time by an occasional potter.

At Sweet-Meadow Brook the change to Stage 2 pottery is dated by a Carbon-14 measure of about A.D. 1000. The sample tested was taken from nine long oyster shells found in a grave in close association with potsherds, which had interior stick-wiping over cord-marking. This seems to indicate introduction of a new technique called stick-wiping. All through this period and the next the use of a two or three pronged implement, probably of wood, appears to have been a favorite tool that replaced the cord-wrapped paddle; cord-marked interiors appear no longer. By obliquely stick-wiping the pot's interior with this tool, clay coils were repeatedly cut across. This proved to be a considerable improvement over the old method of paddling, which more effectively bound the coils together. By this much potters had increased their skill. And so the second period of ceramics was born.

Stage 2 is identified not only by this new stick-wiping technique, but by a universal effort of potters to beautify the pot with simple design treatments, produced by punctate, dentate, rocker-stamp, and trailing methods of marking; the body's exterior was either left plain, or was cord-marked. During this period discovery was made of how to effectively use crushed shell temper, used interchangeably with medium mineral temper. Vessel necks became somewhat constricted, while rims continued to be irregular, but were usually flattened, and were often embellished with some sort of simple decoration by jabs or dentate tooling. The conoidal shape of the pot was retained as a basic feature throughout the entire period, which lasted for about 400 years.

At its termination, further advance in techniques and styling took place, which marks the arrival of Stage 3 about A.D. 1400. In this period of development certain changes occurred, which improved the looks and structure of pots. Elaboration of design treatment was achieved with use of geo-

metric motifs and the all-over herringbone design, often made by incision; the stylus was in use, probably for the first time. Pot rims were more elaborately decorated, and were regimented with even formations. Sometimes, they were bisected on top by the same tool used for the rest of the design treatment. Occasionally, rims were slightly decorated inside as well. They were sometimes strengthened by means of thickening the top of the neck with an extra coil of clay to form a laminated collar. By the close of the period a pressed-out collar was produced without castellations. Stage 3 pots often have cord-marked exteriors with semi-globular shapes, in which the basal point becomes less prominent and more rounded, although the old conoidal shape is also much in evidence.

The last period of development is thought to have started about A.D. 1600, when, as it seems probable, Iroquoian pottery styles diffused into New England. Stage 4 pots, in evidence at Potter Pond and elsewhere, show Iroquoian influence, which seems to place this last development period in proto-historic times. Chief diagnostics by which this ware may be recognized are numerous. Pots have pressed-out collars, usually with four castellations, rarely without — occasionally there are only two, and infrequently in small pots, just one. Designs are usually incised, although sometimes they are executed by line-dentate stamping. In either case, they are meticulously worked with a more or less elaboration of linear and chevron motifs. Bosses of corn and the human face occasionally are to be seen, but they are the exception. Necks tend to be deeply constricted under prominent collars. Interiors are always plain and tool-smoothed, while exteriors are often cord-marked and smoothed over. Necks are left plain, sometimes slightly decorated with a single horizontal band of dentate jabs. Rims are often embellished with simple decorations, which occasionally are carried inside as well. Contrary to Iroquoian ware, the pot's shape is usually semi-globular, more like some Stage 3 pots; a full globular shape is more often found on small vessels of this stage.

With interpretation of evidence completed from the seven selected sites, a fairly clear picture is had of man's struggle for survival in this New England area. However, there is still much to be discovered from future controlled excavation of sites yet to be located. For example, it is important to know more about the different abodes made by man in the four culture periods; what they can tell us about his mode of life, and how their structures may have been determined by his changing environment. Then, we need to find out more about the manufacture of stone pipes, as to when they first were introduced, and under what conditions. Also, information is needed to explain the reasons for such apparent concentrated pipe making at the Oaklawn quarry, and its sparsity at other quarries. In the field of rituals, there is much to learn about the meaning of cremation as practiced by the Stone Bowl Makers, and as shown by evidence at Wapanucket 6. Then, the reason is needed to account for the breakage and deposit in secondary burials of quantities of large stone bowls, along with amazingly large and finely wrought projectile point blades at the Hawes site in Lakeville, Massachusetts. In the realm of Paleo man the surface is only just scratched, with little known about how he managed during the first half of the period to kill the giant sized prehistoric animals, which he hunted; what his shelters were like; how, and for what he used gravers and drills, like those found at the Bull Brook site. Unknown facts about early man's life in this area are endless, but many, it is hoped, will be revealed as new sites are found and excavated with documented care.

Bronson Museum, Attleboro, Mass.
March 17, 1962

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THE INDIAN ROGER SITE

ARTHUR PETZOLD

Editor's Note: As a member of this Society, Mr. Petzold is to be commended for his careful work in recovering archaeological evidence, as related in this report. It forms a valuable sequel to his first report: "The Eaton Site: A Dugout Workshop," M.A.S. Bulletin, Vol. 22, Nos. 3 and 4.

The Indian Roger site is located about one-fourth mile to the west of the Town of Andover. It was on this location Indian Roger lived during the colonization of Andover. This territory was known to the Indians of the region as Cochichawicke.

In the year 1644, the town fathers opened negotiations with the Indians for the purpose of purchasing the Cochichawicke area. As a result of the conference, Indian Roger of Andover, and Cutshumachin of Wakefield dictated the unusual terms found in the original land deed, on record in the Court House in Boston.

In brief, the colonists were to pay Roger the sum of 24 pounds and a great-coat for the territory. Indian Roger et al., were still to retain the "four acres he now plants"—the word "plants" refers not to agricultural activities, but, in the terms of the times, "lives". He was also allowed to steal corn and other produce from the settlers, as long as he did not steal too much. No record can be found of what eventually became of Indian Roger after this land sale was made. Historical records mention an "Indian Mary" trading in the township as late as 1840. Early records do state that many of the Pennacooks of the region voluntarily moved to a reservation located at St. Francis, Canada. Rumors also indicate that others moved to the Penobscot reservation at Oldtown, Maine. Nothing more substantial is known.

The precise location of this site can be easily identified by its geographic boundaries. The field in which the site lies for years has appeared almost symmetrically square, with its surface covered with the coarsest of grasses. The eastern edge of the area is bounded by the main line of the Boston and Maine railroad, whose rails lie in a north-south direction. One hundred yards to the north flows Rogers Brook. Its waters move in a westerly direction, pass through a culvert beneath the railroad, and flow in an erratic manner to empty into the Shawsheen River between a glacial kame on the left, and a 40 foot terrace on the right. One hundred and fifty yards toward the west flows the Shawsheen River in a northerly direction. The site is bounded on the south by the St. Augustine cemetery, from which it is separated by a small spring-fed stream.

The Indian Roger plot has been known to collectors for many years. Its gently sloping fields have exposed occasional felsite chips over much of its surface after each heavy rainfall, and it has been scientifically tested by archaeologists in past years. Enough occupational evidence has been uncovered in test pits to give a fair impression of the various cultural periods which might be expected to be found at the site. However, no evidence could be found to support the suggestion that extensive excavations had ever been attempted there. For many years this large field has been an area to be occasionally searched with the expectancy of finding little more rewarding than an infrequent chip, or the broken fragment of a projectile point. Nothing of significant value was ever anticipated.

On May 10, 1960, loam stripping operations were commenced at the site. All the coarse grasses and loam were removed by a bulldozer and pushed into ridge-like piles parallel to the railroad bed on the east. Close inspection of the area showed that during the scraping operation, the bulldozer blade had bobbed and dipped along the soil, first below the junction of the loam and yellow subsoil, then above the junction by as much as several inches.

Both the piles of loam and sod were examined, then the surface of the scraped soil, for signs of aboriginal occupancy. To our surprise, many chips of black, as well as grey felsite were observed liberally scattered over the fresh earth of the scraped area. A leaf knife of black felsite, a triangular-shaped knife of grey felsite and a sherd of coarse mineral tempered pottery were found. It seemed that here a site was being uncovered, and simultaneously ruined, while we watched.

Many inquiries directed to supervisors of the project and caretakers of the land soon disclosed that a fairly narrow strip of land, ideally located, would remain untouched for us to test, if we so desired. It was with a feeling of elation and great anticipation that we commenced to dig this narrow strip of untouched soil, the subject of this report. After two years' work, 1,024 sq. ft. were carefully excavated, and 48 recovered artifacts recorded. My wife, Shirley, and my two sons, Harold and Raymond, helped immeasurably during the excavation. Without their enthusiastic aid, this report would never have been made.

SOIL PROFILE

A careful description of the vertical soil profile of the site seems to be warranted at this point. A greasy black loam extends from the surface down to a depth of about 9 inches. From here a yellow-brown soil adds an additional depth of about 2 inches, while 6½ inches of yellow subsoil underlies the above. Total depth of soil with occupational evidence was found to be fairly constant at about 18 inches. During the dig, a metric measure was used, for we believed that with it a more accurate record could be made. At no time was a chip or artifact found deeper than about 18 inches. The area described as the yellow-brown soil, actually, is the beginning of the subsoil; its surface separates it from the loam and is called junction. It is sandy in texture, and contains dark black-brown spots, spherical in shape, thickly distributed throughout the lens. These ball-like discolorations have a size range from bead to silver dollar, and are round or slightly oval. Their presence is open to debate.

METHOD OF EXCAVATION

The loam stripping operations had cut a line from south to north, forming a sloping embankment along the strip of land to be tested. This embankment became the eastern boundary of our excavation. We first cut and trimmed this edge until a perpendicular face was obtained. The nature of the land and the total shape of the area seemed to indicate that standard gridding of the site would be impractical. Since the threat was ever present that our test area might also be subjected to bulldozer scraping, we planned our excavation accordingly.

At each visit to the site, we carefully measured a horizontal square of the exact size we knew we could complete that day. This measured square was then recorded on graph paper, each block on the graph equaling 6 inches. Each square was assigned a number, and sod of the measured square was then cut with a square-edged spade, and piled. This sod, after completing excavation of each square, was returned to its original position. Loam was removed to a depth of about 5 inches. From this point downward, soil was removed by the "peeled-layer" method to a depth of 20 inches. A hand trowel with a 5 inch blade was found to be the most effective tool for the purpose. Chip sequence, as well as artifact sequence, was faithfully recorded. Later, it was found that the chip graph, combined with stone identification, helped immensely in deciding when an artifact might be out of context, and therefore intrusive. There appeared to be a definite association between chip levels, as compared to levels of artifacts made of comparable stone materials.

The greasy black loam of the uppermost level down to a depth of 19cm., about 7½ inches, disclosed an intriguing accumulation of miscellaneous objects, usually assignable to colonial contact times. A slightly worn 1909 penny was found immediately below grass roots. This may approximately date this top level. Deeper in the loam were found fragments of vari-colored glass, bits of dishes, glazed and unglazed, chunks of coal, bits of handmade brick, machine-made nails, hand-wrought nails, T.D. pipe fragments, and a gunflint. Presence of this debris may suggest that in this loam section was a century-old midden, or dump. However, directly below this somewhat homogeneous debris—using typology as the basis for zone analysis—a Middle Ceramic zone occurred in the lower loam. From here down, rapid progress was made, uncovering next at junction and a little below, that which appeared to be the Late Archaic—Stone Bowl zone, under which in deeper subsoil occurred the Early Archaic zone.

Because similar projectile point types repeatedly appeared at specific levels throughout the site, they have been recorded where found as belonging to one or another of these three culture zones as follows: Zone A (Ceramic)—in lower loam down to 4 to 2cm. above junction; Zone B-C (Late Archaic)—2cm. above junction to 5cm. below junction; Zone D-E-H (Early Archaic) — 7.5cm. to 19.5cm. below junction. Representative artifacts, mostly projectile points, of recoveries made from each zone are illustrated, with their type names and culture connections listed (Fig. 7). A few indeterminate artifacts resembling knives and scrapers appeared at various levels (not illustrated). Drill E-11 was found in direct association with Corner-removed #9 point E-12. Drill H-17 and projectile point H-20 were found close together at the same level, which suggests that they may have been made by the same people at approximately the same time period.

Along the Shawsheen River Valley, a type of projectile point frequently can be found on almost all of the sites of the area. At one site, only this type of projectile point is found. Points of this type are usually made of white quartz and are identified as Small Triangular. These distinctive points often occur with Small Stem points, also made of white quartz. However, points falling within these two classifications made of white quartz were not found at the Indian Roger site. Actually, evidence of white quartz as used for artifact manufacture at the site was extremely scarce. Only about 24 chips of it appeared among the several thousand chips of all stone materials

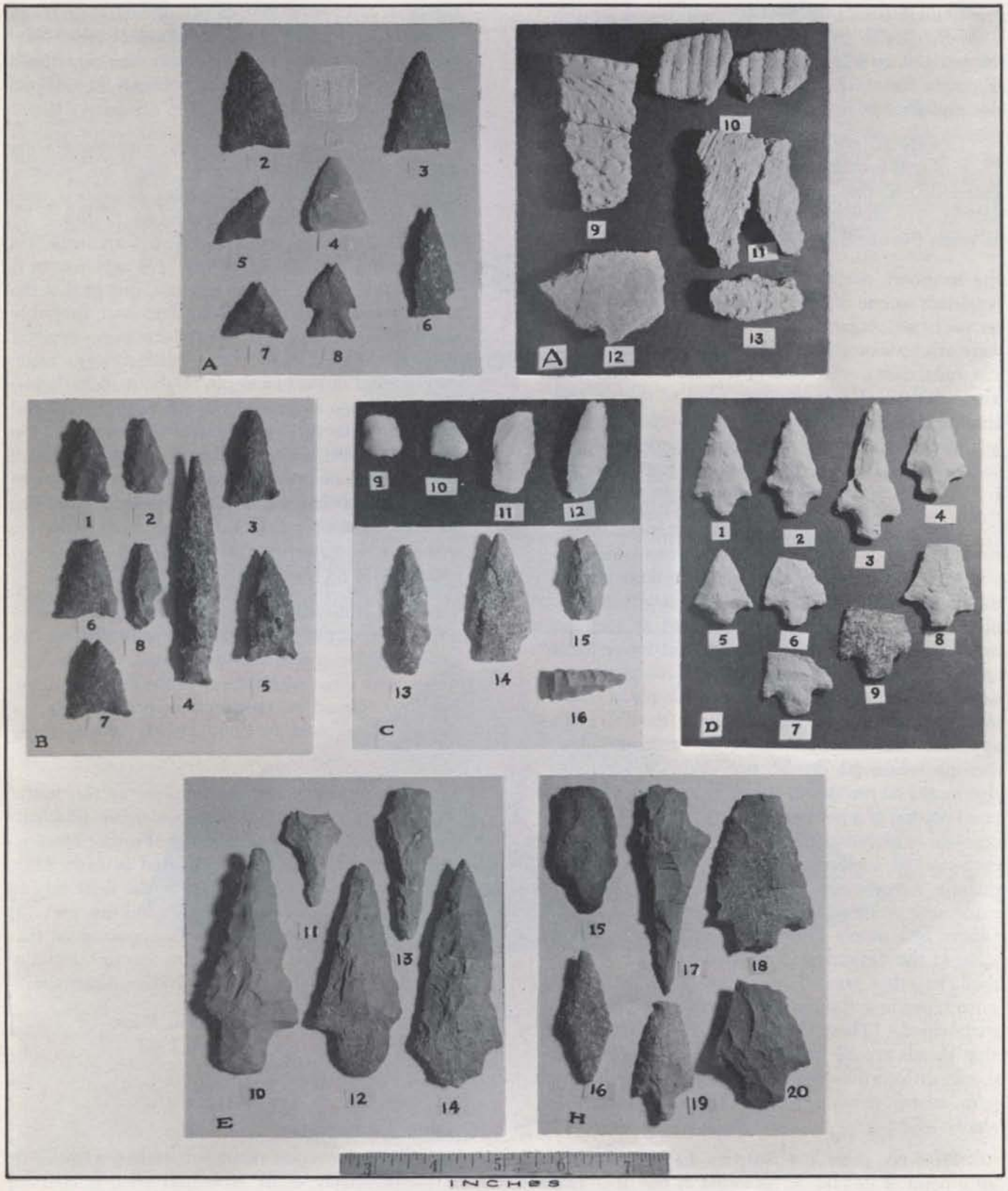

Fig. 7. INDIAN ROGER SITE ARTIFACTS. Zone A (Ceramic)—2-5, 7, Small Triangular; 6, Side-notched #5; 8, Corner-notched Points; 9-13, Potsherds, Stage 2. Zone B-C (Late Archaic, Stone Bowl)—1, 2, Side-notched #5; 4, Side-notched #6; 3, 5-7, Eared #2; 8, 15, Small Stem; 11, Corner-removed #3; 12, 13, Tapered Stem; 14, Corner-removed #7 Points; 9, 10, Scrapers; 16, Drill Bit. Zone D-E-H (Early Archaic)—1, 5, 6, 10, 12, 14, Corner-removed #9; 2-4, 7-9, 18, 20, Corner-removed #5; 15, 16, 19, Corner-removed #8 Points; 11, 13, 17, Intermediate Drills.

recorded. Does the absence of the above mentioned white quartz points suggest that the site was not occupied during a specific period when such points were being used? Or does it imply that a people lived here, who preferred the use of other stone materials, since a few specimens of these two types of points occurred, made of felsite, quartzite, jasper, and flint?

Exactly 45 potsherds were found at the site. These sherds proved to be a real problem, since our knowledge of this important subject is somewhat limited. We hope the reader will sympathize with us when the cause of our confusion is explained.

In theory, one should be able to assign various potsherds to one of four different time periods, referred to as Stages 1, 2, 3, and 4. Which Stage ware any specimen is, is determined by noting various traits, such as thickness of sherd, kind of temper used, method of manufacture, type of design and kind of technique employed, and sometimes the quality of the ware. In theory then, there should be no trouble in identifying and classifying potsherds from the Indian Roger site, bearing in mind that those sherds lying the deepest, and undisturbed, are presumed to be the oldest of the site.

In practice, all sherds were recovered from a depth of from 4 to 2 centimeters above junction. Sherds of the larger sizes were tilted at such an angle as to cover both the upper and lower loam levels. Sometimes, sherds with fine mineral temper were found on the lower level, while sherds of crude manufacture were located above. [Possibly this apparent inconsistency might be accounted for through refuse pit disturbance—Ed.] Several design motifs on rim sherds could be identified, but no basal portion of a pot was found to indicate whether conoidal or globular pots were present. Sherds with cord-marked surface outside, but not inside, frequently were found. A few sherds with designs made with probable thumbnail jabs were recovered. Others had simple punctate designs, while a few showed the designing tool to have been a scallop shell, its edge pressed in. Many were plain and smooth inside and out, while others were plain and stick-wiped. [These descriptions seem to indicate that sherds are all from Stage 2 pots. No Stage 1 sherds with cord-marked interiors and exteriors, and with coarse mineral temper appear in the evidence—Ed.]

Projectile point B-4, Side-notched #6, was the only point of its type to be found at the site. This point is singled out because of the way in which it lay. It was uncovered, precisely, at junction in Zone B-C, where it rested in a horizontal position. Its upper face had its surface covered with black loam, while its lower face rested on the yellow-brown subsoil. The blade seemed to neatly divide the loam level from that of the subsoil at junction. [This type of point has been found at other New England sites at junction level, also, and is believed to represent transitional times between Stone Bowl and Ceramic ages—Ed.]

Missing from the site's recoveries are a wide variety of implements. Among these are gouges, grooved axes, celts, atlatl weights, plummets, and agricultural tools (hoes, corn-planters, pestles, etc.) Articles of steatite, including bowl fragments, are also missing from the inventory. No explanation is offered to account for their absence, except that the area excavated is limited in size, and probably should not be expected to produce every type of artifact. Bits of bone and charcoal were often encountered down to a depth of about 10cm. below junction. Bone in general was too fragmentary and fragile to be used for purposes of identification. On the lowest level E-H, bone could only be identified with the aid of a 10X glass. Here, no sample of either bone or charcoal could be positively identified as such by eye.

No postmolds were found. As each telltale discoloration in the soil was discovered and traced vertically, it invariably proved to be the remains of a tree root, or the filled-in hole of some rodent. No undisturbed stone hearth was found. Fire-burned stones were often encountered in the first two zones, but they formed no recognizable pattern. No fire stones were found in Zone D-E-H of the Early Archaic.

This report is not as complete as the writer would have liked it to be, since many problems cannot be satisfactorily explained. Further research at the site was abruptly terminated in early May, 1962. On this date we arrived at the field only to find heaps of gravel resting upon the test area. It is, therefore, with considerable disappointment that circumstances have cut short this account, containing only the partial story of the Indian Roger site.

Andover, Mass.
July 9, 1962

APPENDIX

Editor's comment:

While this report represents evidence from only a comparatively small excavated area, it contains features, which are worth further study. Of contributing value is the fact that previous plowing has either been absent, or if it existed, never

reached the junction, and therefore caused no appreciable disturbance to artifacts of the Late and Early Archaic zones. With this in mind, it seems significant that Small Stem and Small Triangular point types do not appear in Zone D-E-H of the Early Archaic. Instead, the Small Stem trait first appears in Zone B-C of the Late Archaic, and the Small Triangular in Zone A of the Ceramic. This is similar to evidence from other excavated sites in Rhode Island and Massachusetts, except that at these locations the Small Triangular with convex sides appears with Small Stem points in the Late Archaic industrial Stone Bowl zone.

Another important observation concerning the Indian Roger site recoveries is that projectile point types, Corner-removed #5, 8, and 9, all occur at the lowest level, Zone D-E-H of the Early Archaic, whereas Corner-removed #7 and Eared types appear in Zone B-C of the Late Archaic. As this same sequence is present at other excavated sites, this new supporting evidence from Andover helps establish its reliability, as related to a probable culture pattern. While some of the Early Archaic specimens, as illustrated, are somewhat ill-defined, enough are well-shaped (Corner-removed #5, 8, and 9 types) to indicate this trend.

A PORPOISE EFFIGY

MAURICE ROBBINS

Occasionally, one finds among the articles recovered from an aboriginal site an artifact that might be classed as an effigy or fetish. Possibly, such an artifact represents a clan symbol. One such specimen was found while excavating for a modern grave, in the colonial graveyard just back of the Old Ship Church, Hingham, Massachusetts. It came into the possession of Dr. Henry F. Howe of Cohasset, and was given by him to the Bronson Museum where it is now on display (Fig. 8).

This particular specimen is made from a fine grained steatite (soapstone), well formed and polished slightly. It represents, according to Col. Eugene S. Clark, Jr. (a marine biologist), the common

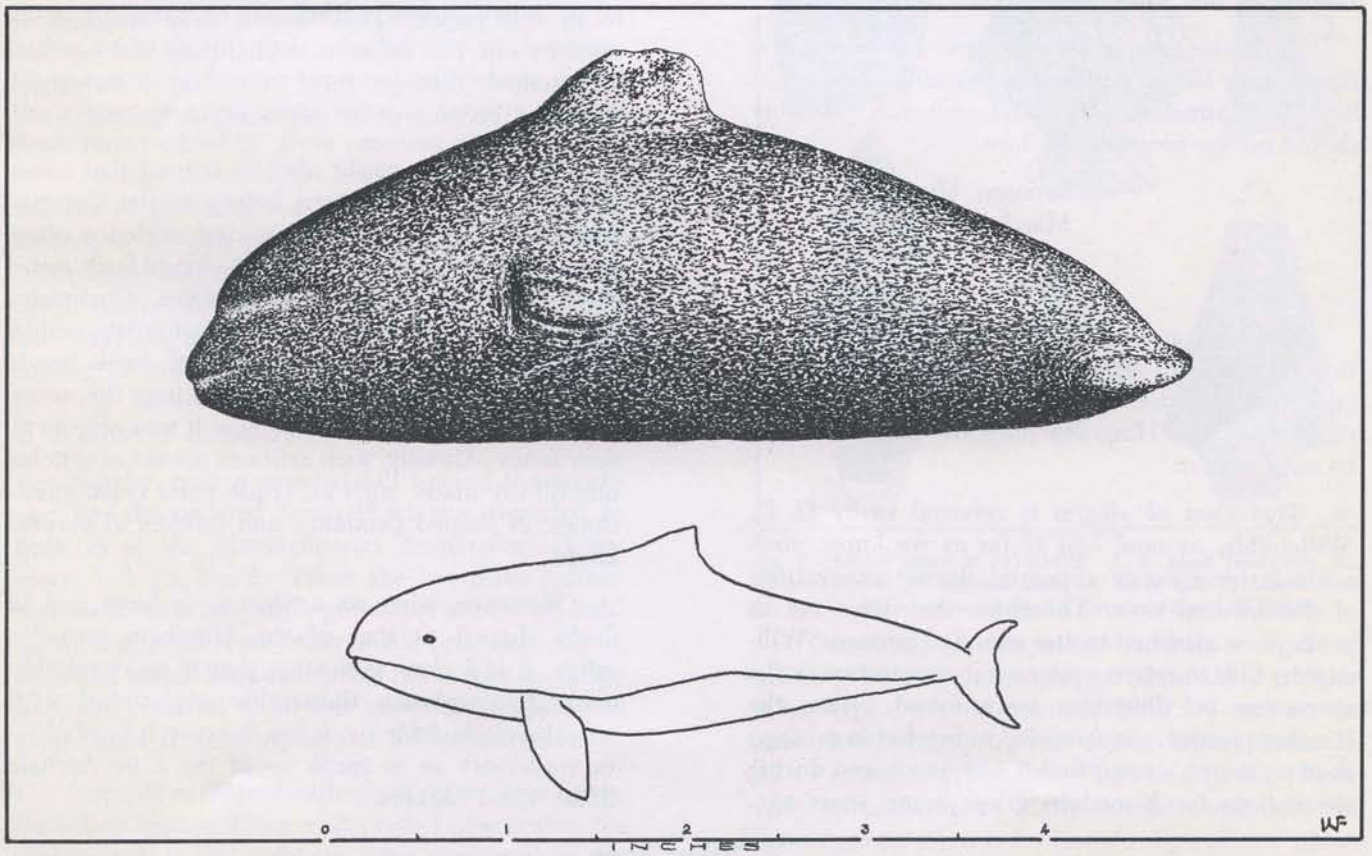

Fig. 8. PORPOISE EFFIGY. Outline figure is a common harbor porpoise, 5½ to 6 ft. long.

harbor porpoise (Phocaena phocaena). The artifact is 5½" long, and 1⅜" wide at the dorsal fin. The mouth and blow holes are represented by properly placed grooves. The dorsal fin is prominent, but the front flippers and tail are indicated by protrusions, which represent, but do not show the members in true shape.

Concerning this mammal, Col. Clark says: "This little fellow was quite common in our bays and harbors at the time the white settlers arrived, but was hunted far too much in the earlier days both for oil—and food. As the steaks are excellent eating, I have a feeling that the Indians found this out, and doubtless used both the meat and the oil."

C. C. Willoughby, in his "Antiquities of the New England Indians," shows three similar artifacts (Fig. 29, p. 50). He calls attention to the fact that certain smaller fish effigies were made and used as fish lures by both the Eskimo and the Indians. They were made of either stone or ivory, and when in use were attached to a line, which carried one or more leaders with hooks. The larger specimens, as illustrated in his figure 29, represents: a) sperm whale, from Fall River, Mass.; b) right whale, from Seabrook, N. H.; c) fish of unknown species, from Salem Neck, Mass. All of these specimens are about twice the size of the Hingham effigy. Willoughby says it is doubtful if these specimens should be classed as fish lures.

As in the case of two of these specimens, the Howe effigy has no perforation to which a line could have been attached, and therefore it, too, probably should not be considered a lure.

Bronson Museum
March 24, 1962

APPENDIX

Editor's comment: Since determining the culture to which an artifact may belong is always an important consideration, a word concerning culture relations of the Hingham porpoise effigy may not be out of order.

This class of effigies is referred to by C. C. Willoughby as rare, and as far as we know, such artifacts have never appeared during excavations of documented sites. Therefore, they have not as yet become attached to any stratified horizon. Willoughby fails to report under what circumstances the specimens he illustrates were found. Also, the Hingham recovery is shrouded somewhat in mystery as to its source, except that it was uncovered during excavations for a modern grave, some years ago. Whether other artifacts appeared with it at the time is not known. Without such information to show whether it might not have been part of the grave goods of some aboriginal burial, the opportunity of judging its age or culture associations seems slight.

However, there is one criterion present, which has proved useful in determining the culture position of other artifacts, and may well serve in this case to reveal who were the makers of this effigy. Soapstone, of which it is made, may be the key to this mystery. This stone, to the best of our knowledge, was never used by Paleo or Early Archaic nomads for any of their artifacts. All evidence points to the fact that the Late Archaics (Stone Bowl Makers) were the first people to discover soapstone outcrops, and use this soft stone for many of their artifacts. Besides all manner of bowls, and three types of stone pipes, they utilized it for such other articles as gorgets, pendants, boatstones, birdstones, plummets, and ceremonial trinkets, to mention only a few. Furthermore, it seems likely, to judge from evidence uncovered from certain coastal sites in the Northeast, that people of this age, who lived near the ocean, became skilled in hunting large marine mammals, such as the porpoise. Therefore, what would have been more natural than these resourceful hunters of this industrial age should have fashioned out of soapstone effigies of the kind referred to in this paper. They would have selected, it would seem, this stone, to which they had become accustomed through their stone bowl industrial activities, because of its soft workable properties.

Of course, it might also be argued that some artifacts made of soapstone belong to the Ceramic Age that followed, since excavated evidence often reveals articles — usually small — made from stone bowl fragments in this culture zone. Obviously, these descendants of the former industrialists, would have come across broken remains of stone bowls appearing at their camps, and, finding the stone soft, would have been led to shape it into objects of their fancy. Usually, such artifacts consist of articles unskillfully made, such as, crude paint cups, anvil-stones, ill shaped pendants, and fetishes of various kinds.

However, when an artifact is as large and as finely shaped as that of the Hingham porpoise effigy, it is a clear indication that it was probably made by workman thoroughly acquainted with soapstone. And for us, it has become a symbol — or trademark so to speak — of the Late Archaic Stone Bowl Makers.

A CERAMIC POT FROM THE SWAN HOLD II SITE

Russell E. Holmes

In December 1961, the writer with other members of the Massachusetts Archaeological Society excavated a site in the Swan Hold district of Carver, Massachusetts. Permission to excavate was kindly granted by the owner, Louis Sherman of Plymouth. The plot covers a small area of a sand terrace, and extends about 200 feet along the west bank of a brook, the outlet of nearby Wenham Pond. The site is comparatively level back to a point about 75 feet from the brook. Here the land rises to form a low-lying hill. The brook flows south into South Meadow Brook, which empties into the Weweantic River and thence into Buzzards Bay. The area is covered with variously sized trees 50 to 75 years old, while rotten stumps of older and larger trees of an earlier growth are still visible. Therefore, excavation was confined to random openings between trees, wherever soil was free enough of roots to make digging possible. Careful troweling was employed, and observations were made as to the various depths in the strata where artifacts occurred.

Soil distribution consists of a thin layer of humus with a depth of only 2 to 6″, which in its thinner deposits appears to be made up largely of leaf mold. This is underlaid by yellow sand, which extends down to a white sand base. Almost all artifacts appeared in the humus and at junction: a rather wide and irregular shaded line of demarcation separating humus from subsoil, which defied the taking of exact measurements from it. A few were found about 5″ from junction in the subsoil, representing the earliest level of occupation. A number of pieces of red brick, recovered from the humus, is the only evidence of contact with white occupation, and may indicate some sort of insignificant use of the site by later-day visitors, or from cranberry bog operations nearby. So far as extensive mixing of soils is concerned, there was no sign of plowing. Therefore, the site is presumed to be free of this sort of disturbance.

Nearby, over a wooded hill toward the southeast lies the original Swan Hold site, reported in Bulletin of the Massachusetts Archaeological Society, Vol. 13, No. 2. Here, the last three culture periods of New England's prehistory are noted, indicating a general occupation of the area over a long period of time. Because of this previous report, the new site referred to in this paper is identified as Swan Hold II, for purposes of differentiation.

Some 40 to 50 projectile points of various types, including broken bases and perfect specimens, together with a few scrapers were recovered in the course of excavation. Their stratigraphic positions, as related to their types, seem to throw some light upon the various culture occupations of the site, with important bearing upon the ceramic recovery, the subject of this report.

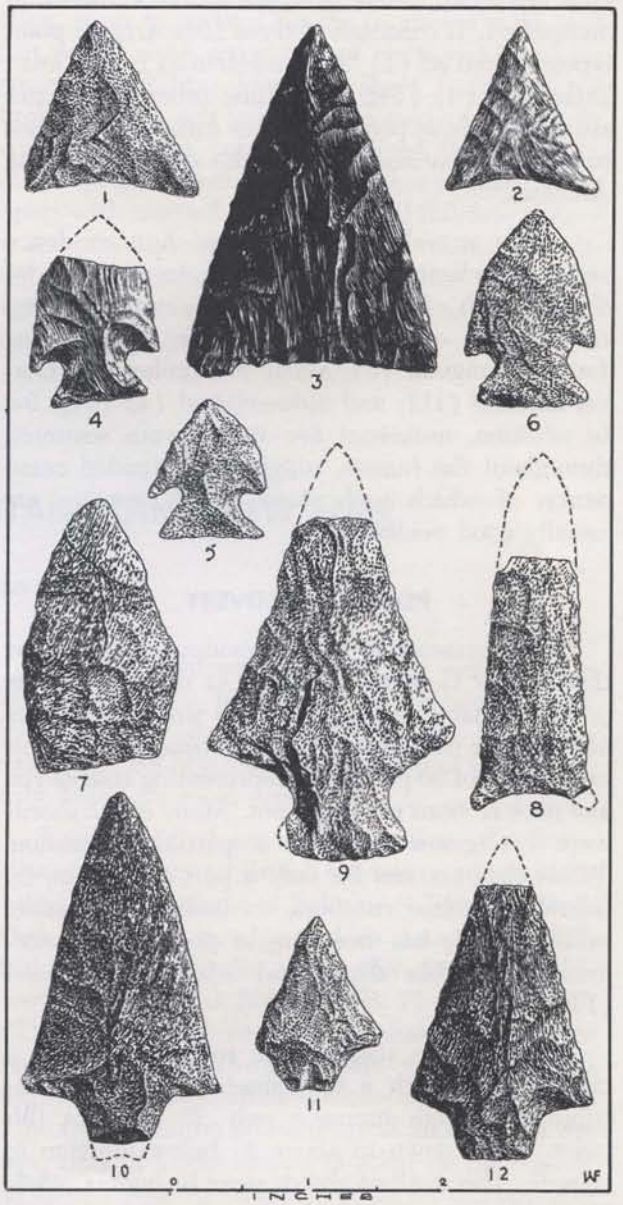

Fig. 9. SWAN HOLD II ARTIFACTS. 1, 2, Small Triangular; 4-6, Corner-notched; 7, Tapered Stem; 8, Eared #2; 9, Side-notched #1; 10, 11, Corner-removed #5; 12, Corner-removed #7 Points.

Occurring in the yellow sand at a depth of about 5″ below junction appeared an Early Archaic point type: Corner-removed #5 (2); and at the same level, Late Archaic types: Corner-removed #7 (1), and Side-notched #1 (1) (Fig. 9). Probable intrusion of an Early Archaic trait into the Late Archaic zone is indicated. Sparsity of points at this level seems to suggest only a short occupancy

by Archaic peoples. However, two deposits of charcoal containing quantities of small stick embers and many calcined bone fragments occurred 8 to 10″ below junction. As a thick layer of yellow sand separated this feature from junction, it is believed to represent open hearths of the Archaic, not collected residue at the bottom of refuse pits.

Above these culture remains, at junction or a little below, appeared more substantial evidence of occupation. It consisted of three Late Archaic point types: Eared #2 (1); Tapered-stem (1); and Small Triangular (4) (Fig. 9). While other diagnostics are absent, these point traits are sufficient evidence to indicate continuing use of the site by the Late Archaics.

With arrival of the Ceramic Age, evidence seems to indicate longer and more frequent use of the site with appearance in humus, starting at top of junction, of important Ceramic point types: Large Triangular (3); Small Triangular (6); Corner-notched (11); and Side-notched (4) (Fig. 9). In addition, numerous fire stones were scattered throughout the humus, suggesting extended occupancy, of which such stone hearth remains are usually good evidence.

POTTERY RECOVERY

With presence of Archaic evidence lying below that of the Ceramic in mind, as outlined above, pottery remains recovered by the writer at the site may now be considered. Good fortune attended his uncovering of 90 potsherds, representing sizable rim and neck sections of a large pot. Many of the sherds were contiguous enabling a partial restoration. While they account for only a part of the pot, by following surface contours, an outline restoration, as illustrated, has been made possible, approximating probable shape and size of the vessel (Fig. 10).

All of these sherds were recovered within a circular area with a 6′ diameter, and were distributed through humus — only 2″ thick at this point — and down to about 4″ below junction in subsoil. The smallest sherds were in humus, while larger pieces ranging in size from 1 to 4″, of which 10 were rimsherds, lay below in subsoil. All, except scattered small sherds, were grouped in close proximity and seemed to have suffered but little disturbance. Further excavation in the immediate surrounding area failed to produce additional sherds. This seems to indicate intentional deposition of the remains within this limited space. Since plowing disturbance is absent, this sherd concentration probably represents refuse pit disposal. However, because shellfish remains did not appear, and animal bone refuse was also absent, no organic matter existed to aid in tracing the pit's shaft. Therefore, projectile point evidence from the surrounding area, as previously outlined, is all that remains from which to make a deduction. From this evidence it seems obvious that the pottery recovery, with sherds extending deep into what has been determined as the Archaic zone, and with only a thin humus cover at this spot, must represent an intrusion from humus. For the humus zone has been shown by the type of its points to be that of the Ceramic Age, while that below is the Archaic (pre-Ceramic). Therefore, this pottery feature should probably represent deposition of the last culture occupants. This seems to be the most logical conclusion to draw without more precise evidence.

Plymouth, Mass.
May 21, 1962

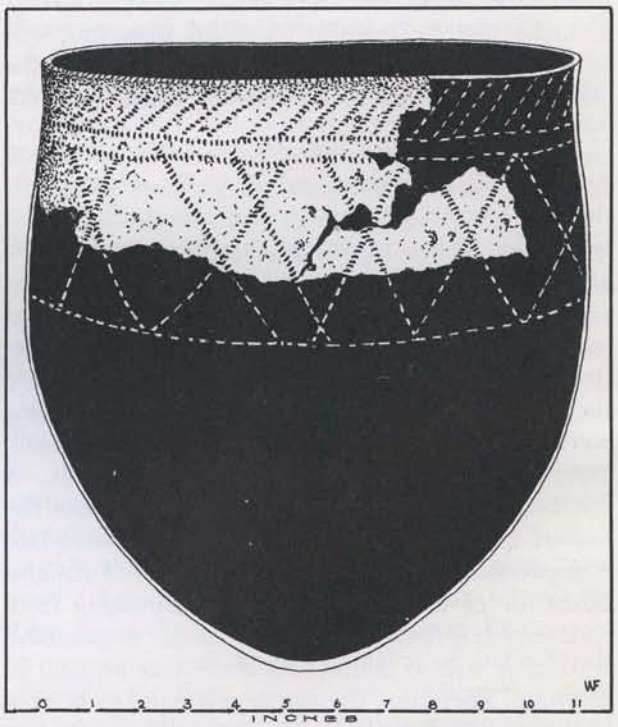

Fig. 10. SWAN HOLD II POT, STAGE 3.

APPENDIX

Editor's Comment: In attempting to place this Swan Hold II pot in the ceramic development stage to which it belongs, it is necessary to resort to typological analysis, since the top, or level of origin of the refuse pit in which it appeared, is unknown. Examination of the restored section, as illustrated, and projecting its known contours indicates a pot having an 11″ opening at its mouth. While depth cannot be definitely determined, presumably, it was such as to produce a conveniently sized vessel, semi-conoidal in shape, similar in proportions to

other New England pots restored by the writer. The ware has vegetable temper and is uniformly thin with a body thickness of ⅛", which thickens at the rim to 3/16". It has a plain finish within and without, with indications of having been tool-smoothed. The rim is flat and is uniformly shaped, with its top edge marked with simple frets. An extensive design motif covers a slightly constricted neck, and some of the body, as a section from another part of the pot, not illustrated, clearly shows. This has permitted projection of the design motif, as shown in the illustration. The motif is composed of a series of oblique dentate markings, possibly stylus jabs, over two horizontal dentate bands, beneath which, extend oblique dentate lines cut across each other in reverse directions to form large diamond figures. These are terminated by a single horizontal dentate band.

Reviewing these descriptive traits, the decorated, flat, evenly-formed rim, together with the dentate geometric design motif extending down onto the body, with plain, thin, well-made vessel walls suggest a Stage 3 pot. Skill required to make such a pot should not be expected until the end of Stage 2, when enough time would have elapsed to allow discovery through trial and error of new ways of overcoming old problems. One of these was: how to join coils of clay together, one over the other, so as to make a tightly combined solid wall that would resist separation of coils, and make for greater durability. Since no sherd from this pot broke along a coil joining, it is evident that in its construction the potter had solved this problem. While the pot's base is missing, other restored Stage 3 pots with original bases preserved indicate a more or less conoidal shape, with a trend toward a modified rounded point. These traits, when considered together, seem to indicate for this pot an early position in Stage 3 times.

A DATED PIPE BOWL FROM MANHATTAN ISLAND, NEW YORK

Edward J. Kaeser

INTRODUCTION

White kaolin smoking pipes of Dutch and English manufacture are a common archaeological find in and about Metropolitan New York. Due to the diverse bowl and stem forms, manufacturers' identification stamps and the long period of use of the clay pipe in this area, from early European, (Indian contact) to the present, these artifacts often pose a problem of establishing their national origin and historical dating.

To further complicate identification of these fragile items, the disconcerting practice among the Dutch pipe makers and directors of their guild was to rent, loan, trade, sell and inherit makers' marks. Thus, many years of continuous manufacture occurred with little or no change in pipe style or recorded maker's personal stamp (Omwake 1959, p. 131). It is probable, the English guild followed a similar system of operation due to their earlier start in the tobacco trade and the flourishing European and American market of the period.

The traditional clay pipe center of the world at Gouda, in the Netherlands, even today, manufactures approximately 7,000,000 pipes yearly (Weber, 1962, p. 41). Dutch-made T. D. pipes and the graceful, long stemmed churchwarden, popularized in the early eighteenth century, are purchased in large numbers in New York City tobacco shops. These modern day examples of the clay pipe maker's art are utilized to a large extent to enhance early American room decor

Early twentieth century excavations of a Revolutionary War period British hut site on upper Manhattan Island brought to light an elaborately decorated clay pipe bowl found in association with British military buttons of the 28th and 42nd regiments (Calver and Bolton 1950, Pl. III, pp. 283, 287). The writer recently purchased a German manufactured churchwarden pipe at the Williamsburg, Virginia Restoration. This seems to be identical to the Calver-Bolton archaeological find bearing the royal arms of Great Britain in relief on the wall of the bowl facing the smoker, while on the opposite bowl face is a branch or vertical grouping of leaves. The availability of such pipes today and their possible manufacture from original molds adds to the problem of dating future archaeological finds.

DISCOVERY

In July of 1954, during the construction of Public School 87, (William T. Sherman School) at West 78th Street and Amsterdam Avenue, New York City, the smashed and burned fragments of a

meerschaum-like white clay pipe were discovered by the writer. The tightly clustered pipe fragments were exposed near the northeast entrance of the building in the excavated foundation trench profile, at a depth approximately 2 feet below the sidewalk slabs in a matrix of dense charcoal and fire reddened earth. The shattered fragments, when first discovered, appeared to be pieces of white plaster building debris. However, when one of the largest intact portions was examined, it proved to be the thick mushroom-shaped, stem-receiving shank of a large pipe bowl. The remaining 14 fragments, some partly burned black and fissured by heat, disclosed numerous curvilinear incised lines and portions of figures deeply carved in relief.

RESTORATION

After all the recovered fragments were cleaned and slowly dried, a length of soft lead solder wire ⅛″ in diameter, waxed to prevent adhesion, was inserted in the intact shank section. The pieces were fitted and glued into proper position along the wire core with transparent plastic cement. The interstices between contacting fragments and small voids due to missing pieces were filled with patching plaster, and the areas of damaged carving modeled and smoothed. Then, the wire core was withdrawn. When reconstruction was completed, three thin coats of clear plastic were sprayed on the pipe bowl to prevent staining of the chalk-like surface by handling.

The restored pipe bowl's general shape compares with the modern briar pipe bowl known as the "Oom Paul." It is characterized by a large straight walled bowl, a deep well holding a heavy tobacco load, with its stem shank bent upward at an acute angle (Weber, 1962, p. 50).

Figure 11, b, c, illustrates the encircling carving of the bowl's exterior. Viewed by the smoker, on the right side, is a shingled peaked-roofed house of clapboard construction with four windows on the building's side, and three above the front door. Following the carving around the face of the bowl is the animated figure of a galloping horse, with flowing mane and tail and mouth agape, against a background of intricately carved trees and foliage. On the left side facing the smoker is carved what appears to be an arched town gate, with castellated battlements at the roof and above the entryway. On the underside of the bowl (a) below the horse's hoofs, is a framed rectangular plaque with the carved date of 1781. Beyond the plaque and terminating near the stem-receiving end of the bowl is a scroll-like leaf motif carved in high relief.

The pipe bowl measures 3¼″ in length by 2″ in height. Bowl diameter 1½″, orifice ⅜″, and tobacco well depth 1⅜″. The 1⅜″ diameter mushroom shaped shank (d) is bevel bored, ½″ at the exterior, and

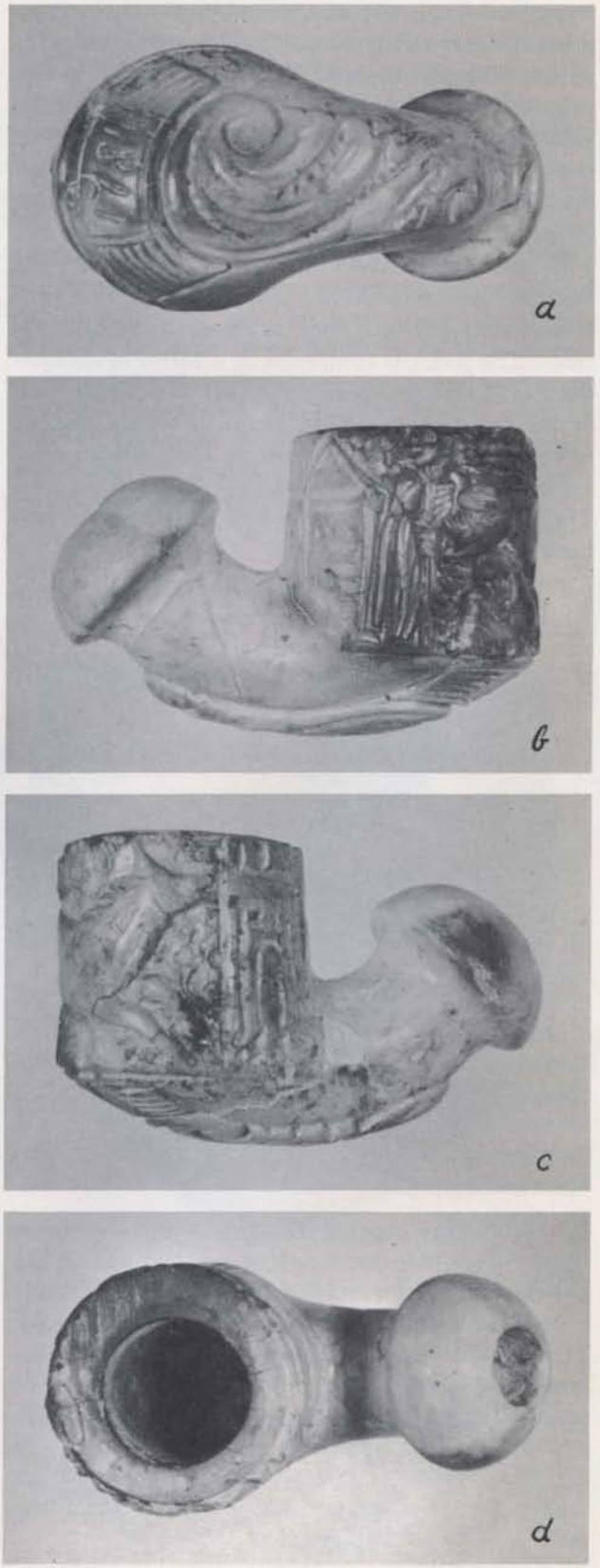

Fig. 11. 4 VIEWS, CARVED PIPE BOWL. Manhattan Island, N. Y.

tapers to ⅜" where it perforates the bowl. The wide mouth of the bore was probably designed to accept a funnel-shaped cork sleeve, through which a reed stem was forcibly inserted. This sleeve held the stem and bowl securely, preventing the heavy bowl from twisting sideways. The original stem, probably a reed of cherry wood or other material easily bored by removing the soft interior pith, must have been bent to a near full right angle in order to keep the bowl upright, and allow the mouth piece to rest comfortably between the smoker's teeth.

DISCUSSION

Mr. H. G. Omwake, of Delaware City, Delaware, examined the pipe bowl in May of 1957 and graciously forwarded the following pertinent remarks: "It is made of soft porcelain in a rough mold, trimmed and polished. It seems to be a copy of Irish clays which imitated meerschaum pipes, and may have been done in Mexico by descendants of the Frank brothers, presumably the finest carvers in the world, who emigrated from Austria to Mexico".

Apparently, all that is needed to complete the pedigree of this pipe would be the owner's name and address, which was not inscribed on it. Therefore, research was carried to the New York Historical Society's map department for evidence of the Revolutionary War home owner of the land, now occupied by the school.

The earliest dated map examined, filed April 1, 1811, illustrated the immediate area in question, laid out in numbered city streets, much as it remains at present with one exception, Amsterdam Avenue was then named 10th Avenue. Between 77th and 78th Streets, the name Jumel appeared with the symbol for a dwelling, situated slightly north of the corner of 77th Street. This small scale map filed 30 years later than the pipe bowl date is entitled as follows: "This map of City of New York and Island of Manhattan in 1811 as laid out by the commissioners appointed by the Legislature, April 3, 1807." (The Bridges Map or Randel Survey).

Continued search for a larger map of detail of the 77th to 78th Street square block produced a hand-drawn map by John DeLaPlume, dated 1819. The cartographer clearly illustrated the Jumel home, 2 out-buildings slightly northeast of the main house and a contoured bluff, rising northward from the Jumel land overlooking a pond midway between 78th and 79th Sts. This pond was fed by a stream emerging from the northwest on land owned by Jacob Lorilard. The adjoining land eastward of the Jumel estate was in the possession of Lemual Wells. The out-building nearest the dwelling was probably a kitchen, the other building, further east, a stable or carriage house. The former is the approximate location of the pipe bowl discovery. Further evidence relative to ownership of this land during or in the waning years of the American Revolution was not readily available.

We can only conjecture how the pipe bowl came to be lost or disposed of at this particular place on Manhattan Island. The knoll, shown on the DeLaPlume map, appears to be the only eminence existing in the vicinity which could be utilized as a military observation or picket outpost, overlooking the vital roads running north to Kings Bridge. The pond on the western slope would afford an easily accessible watering place for troops or horses. Many of the natural contours changed with the northern expansion of the city. For example, the pond might have been filled, in the process of leveling the knoll, and the pipe bowl transported to the site in the earth fill.

At the time of the pipe's date, 1781, the American Revolution had reached its seventh year. New York City was an armed camp of the British. Clinton's narrative notes 11,929 rank and file, fit for duty at New York and surrounding posts (Clinton 1954, p. 237). October 19, 1781 marked the virtual close of the war with the battle of Yorktown.

It is of interest to note some of the additional uses to which the tobacco pipe was put in America, besides that of smoking pleasure. Indian habitation sites of the contact period produce clay and pewter pipes presented as gifts to, or used as barter with the Indians. Some broken kaolin pipe stem fragments have been used as beads. Excavations below the floor of the Jamestown church, circa 1639, disclosed broken pieces of pipes attributed to grave diggers, who used tobacco to ward off contagious disease (Cotter, 1958, p. 224). The pipe rose from the simple object of personal enjoyment and relaxation to the station of a status symbol in mid 18th century society, when pipes were given to invited guests at funerals as personal mementoes (Calver, Bolton, 1950, p. 228): "New Rochelle 1743, one gross pipes £0.3.0 did service at funeral of Frederick Devoe." In later years, clay portrait pipes were made commemorating political campaigns and athletic notables of the day.

CONCLUSION

Although the pipe bowl is not of Turkish meerschaum (hydrous magnesium silicate), nor is fitted with a stem of pure amber, it can still be regarded as a true work of art. This was not the penny pipe commonly used by the farmer, soldier, or tradesman of our colonial period, nor was it com-

parable to the fashionable churchwarden of the military and citizen gentry. If tobacco was as expensive a commodity as has been documented, the owner of the pipe must, of necessity, have been financially wealthy to afford more than an occasional pipe load. A level bowl filling will hold almost double the amount of tobacco of the contemporary churchwarden pipe. This pipe bowl is the first of its type seen by the writer from the New York City area, and the fact that it is dated makes it unique.

Bronx 61, New York

January, 1962

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DISCOVERY OF 52 CACHE BLADES IN SQUANTUM

William T. Williams

In the fall of 1961, the writer was beachcombing along the shore of Squantum, Massachusetts, where he found a crudely chipped leaf-like piece of flinty stone. It lay near the high-water tide mark at an exposed part of the beach. The writer's attention was then attracted to a similar stone, which protruded from the shore bank just above. As a member of the Massachusetts Archaeological Society, the writer did what any good member would have done under similar circumstances, he started to dig.

About 14 inches below the surface of the ground a cache of 52 turtlebacks or semi-finished stone blades, commonly called cache blades, were uncovered. They lay in a circular area having a diameter of about 4 feet, which incidentally contained no shellfish remains (Fig. 12). The cache occurred about 180 feet from a promontory called Squaw Rock (Fig. 13), and only a short distance from a much vandalized cairn. This cairn commemorates the landing of Myles Standish and his

Fig. 12. CACHE SITE, after excavation.

Fig. 13. SQUAW ROCK, Squantum, Mass

party, when they met the faithful Squanto on September 30, 1621. Squaw Rock is located in that part of Squantum owned by the City of Boston, and is situated just south of the city.

Twelve of the leaf-like blades (23%) are made of a dark gray porphyry, while 40 of them (77%) are divided between two fine-grained felsites, one gray, the other red in color tones. Many of them are well shaped, and some have a limited amount of secondary chipping. Others, however, might be classified as rejects, if they had not been found in a cache. The largest blade is 3¼ x 6½", while the average size is 3 x 5"; a representative specimen is illustrated (Fig. 14). Total weight of the blades is 28½ pounds.

Charles C. Willoughby, in his book entitled, *Antiquities of the New England Indians,* writes: "We have reason to believe that the better work of this nature was done largely by professional flint workers, whose chief occupation was the finding of suitable material, the reducing for ease of transportation the selected stone to the smallest sizes conformable to the types of implements to be later produced, and the transportation of these blanks to the home village, where the tools were finished at leisure."

Since the writer's discovery of the cache, he has tried to find the answers to two questions: 1) Where did the Squantum natives get the stone material? And 2) How did they bring it to Squantum? In answer to the first question, it is thought certain they did not get the material in Squantum, since the stones indigenous to this locality are red and gray slates, and a massive deposit of tillite, a conglomerate that contains pebbles of quartzite. Therefore, it seems likely they brought it in from other regions. In answer to the second question, it is probable that they carried the blanks from the neighboring Blue Hills overland, or transported them by canoe from some of the south shore localities, where ledges and boulders of felsite exist. For example, there are outcrops of felsite in the following regions: Brighton, Mattapan, Dedham, Dorchester, Milton, West Roxbury, Blue Hills, Cohasset, Hingham, and Braintree.

Up to the present time, the writer has not discovered the exact sources of the three different stone materials, but this research will keep him busy in future explorations. He has donated this cache of blades to the Massachusetts Archaeological Society, and it is now on display at the Society's Bronson Museum, Attleboro, Mass.

The first blade found near the cache on the shore in Squantum was there as the result of sea erosion. Within a few years the whole cache would have been washed out to sea by the severe storms that batter the New England coast. The writer's collection of artifacts from Squantum includes a shallow mortar of granite, a slate pestle, 2 celts, one of gabbro, the other of diabase, a quartzite hammer-

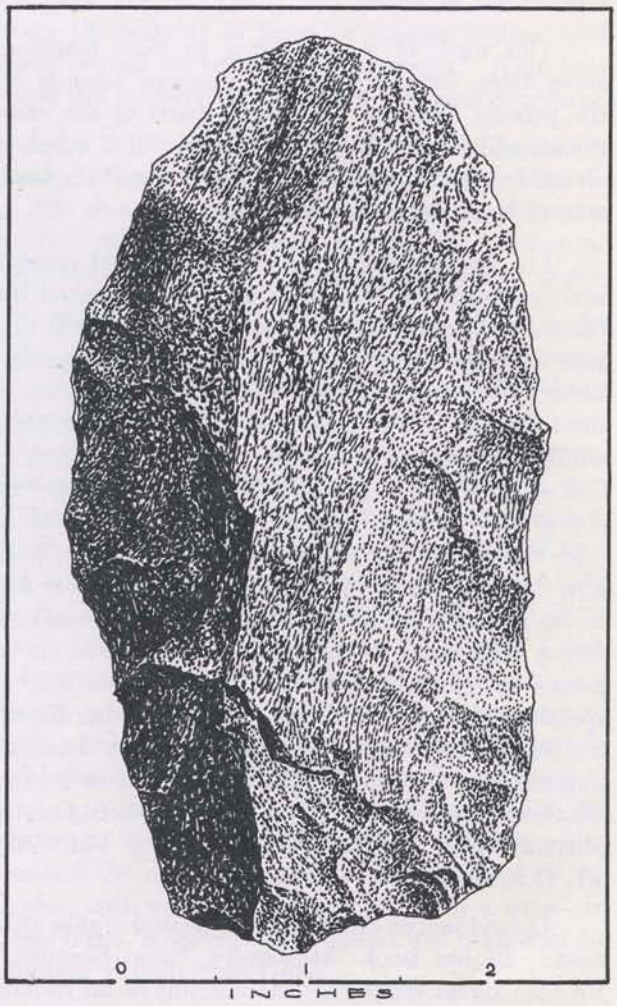

Fig. 14. CACHE BLADE, from 52 blade cache at Squantum, Mass.

stone, a corn-planter, a chlorite pipe-form, and several arrow points. There are a few shell heaps in the area, but so far they have yielded nothing.

Wollaston, Mass.
August 1962

POT BOILING WITH RED-HOT STONES

HOWARD S. RUSSELL

Did prehistoric inhabitants of New England at any period cook their food by means of stone boiling; that is, by firing stones until red hot, then dropping them into a pot, a pit, or a water-tight box or basket so as to heat liquids, boil meat or fish, or cook cereal and other foods? If there is the least likelihood that stone boiling was ever a practice among early occupants of New England, archaeologists should recognize this possibility and be on the lookout for evidence.

This topic of stone boiling in New England arises from consideration of numerous records of the process reported from other parts of the continent, and from thoughtful weighing of a number of circumstances pertaining to the New England area. Let us examine some of these.

1) Though the natives who occupied coastal and southern New England are never reported by observers as using the stone-boiling method at the time of the earliest white explorations and settlements, the earliest whites were much struck by a similar practice; the steam baths of the Indians. One white observer after another, Williams, Josselyn, Gyles, the Jesuits in Canada, describes how, in closed "hot houses," stones warmed by fire to a high degree of heat were dashed with water; and how the Indians sat or lay in the resulting steam for an hour or more, at last rushing out to plunge naked into a chill pond or stream. This was not only a means of cleansing, but the steam bath was a specific against colds, rheumatism, and other ills of the body. You may read the story in a very detailed authoritative paper entitled "Sweat-Houses in the Southern New England Area," by Eva M. Butler, in Massachusetts Archaeological Bulletin, Vol. VII, #1, October 1945.

Do evidences of this use of heated stones still exist? In her book "Massasoit's Town Sowams," Virginia Baker states that the remains of an Indian hothouse, a cell-like chamber with a flat bed of stones built into the river bank at Warren, Rhode Island, were still to be seen in the early 1800's. Another such reminder was more recently reported on the shore of Farm Pond, Framingham. The vapor bath custom, by the way, was a characteristic of Siberian natives, according to Alexander Bradford, which suggests interesting speculations along another line of thought.

2) The Rhode Island clambake is universally given an Indian origin by writers on food and local customs. The method of cooking is to heat a bed of stones to a high temperature, then build above it layers of wet seaweed, intermixed with clams, crabs, fish, sweet corn and other edibles, cover the whole, and let it steam until the sea flavor has been cooked into everything. A certain amount of doubt hangs over this tradition, from the fact that the early writers who describe with care the steam bath and other characteristic native customs new to them, are silent as to the clambake, though they speak of boiling and drying clams.

However, in addition to such modern authorities as the late Dr. E. E. Edwards, who states flatly that the clambake is Indian. Both Frank G. Speck and Fannie Hardy Eckstrom authenticate it as a custom of the Penobscot tribe; and it is difficult to conceive of our white ancestors developing this unusual method of cooking on their own. A Rhode Island excavator, Lewis A. Taft of the Narragansett Archaeological Society, reports something quite similar from his excavation of a site near Narragansett Bay in Warwick, Rhode Island, about 1954. A hearth was found with clamshells placed on edge around it. Apparently, the clams were intended to cook and open from the heat of the fire.

3) Another New England custom, attributed by a host of modern writers to the Indians, is the baking of beans in heated pits in the ground. For example, Ruth M. Stocker, in "Favorite American Foods," states that New Englanders learned from the Indians to bake beans on heated rocks or ashes in such pits. Here again the earliest observers are silent, though small pits with blackened stones in the bottom "which may have been dry ovens" are reported by a Milton historian; and Speck calls baking beans in beanholes a common mode of cooking among the Penobscots.

We would welcome better and earlier evidence. Yet, as in the case of the clambake, there seems no logical explanation for this method of cooking with heated stones other than it had an Indian origin.

4) Pointing more directly to our subject of stone boiling, a legend of the Oldtown Indians recorded by Joseph Nickolar tells how the legendary tribal hero, Klose Kurbeh, hollowed out a place in a rock, brought water from the river to fill it, and then "made a large fire and heated stones and put them into the kettle place; and the water did boil so he was able to eat his dinner." Speck, living among the tribe, in his "Penobscot Man," records that "the widespread practice of boiling water by means of heated stones is well remembered here."

With this tradition in mind, the thought suggests itself that certain of the hollowed depressions in boulders and ledges in this area, up to now considered to have been mortars for grinding corn, nuts, etc., are large enough to have lent themselves to the practice outlined in this legend of the Maine Indians.

5) If early New England natives did use stone boiling, it appears likely that the practice may have preceded the use of pottery, although to my knowledge no excavation has so far produced supporting evidence. Cooking by this method was done by tribes in other parts of North America in several kinds of vessels, all obtainable here, including wooden troughs, birch bark kettles, and various types of waterproof baskets.

Now, in order to weigh adequately the possibilities for such a means of cooking in prehistoric New England, we need to learn more about the process, where it has been carried on, and its results in producing palatable food. A long list of observers will aid our quest.

In Canada, Le Jeune, the French Jesuit, writing between 1632 and 1639, records that he was told that formerly the natives cooked their meat in bark dishes. Wondering how this was possible, he learned "that they put their meat and water into these dishes, then they place five or six stones in the fire; and when one is burning hot, they throw it into this fine soup, and, withdrawing it . . . put another which is red-hot in its place, and thus continue until their meat is cooked. Pierre, the Savage . . . assured me . . . that it did not take so long to cook . . . as one would imagine." (Thwaites Edition: V, 97).

Jenness, in his comprehensive survey, "The Indians of Canada", adds to birch bark kettles, wooden boxes [historic], and bags of buffalo hide, as containers for stone boiling. He quotes David Thompson's Narrative to show how stone boiling was done to reduce maple sap to sugar: "They boiled it in clay pots directly over the fire, and in vessels of birch bark by means of hot stones." H. W. Henshaw, writing in 1890, comments that "the method of boiling down sap in bark or wooden vessels by means of hot stones seems to have been the usual one," and J. L. Hills, in his article on "Maple-Sugar And Maple Syrup" in the Cyclopedia of American Agriculture, refers to this Indian method.

In his journal, Daniel W. Harmon offers a fascinating account of how the Carrier or Tacully Indians of British Columbia cooked their berry preserves. First they made a tub of spruce bark to hold 20-30 gallons. In the bottom they spread a peck of berries. On top of these they placed stones heated nearly red hot. Above these, in went another layer of berries, then more hot stones, and so on until the tub was full. Then the whole was covered; and when the covering was removed, five or six hours later, the berries were perfectly cooked. After cooling, the thick pulp was taken out and crushed in the hands, spread on splits of wood, and dried over a slow fire. The juice in the pot was then rubbed over the dried fruit, and the whole dried again. Harmon called the results (which could be kept for years) very palatable: "far better than [if cooked] in brass or copper kettles, as I have proved by repeated experiments." Note how close this cookery is to the New England clambake.

As to the employment of wooden boxes for stone boiling, La Farge in his Pictorial History, p. 200, shows by courtesy of the American Museum of Natural History, a man picking up a hot stone between sticks, to be dropped into a box of water.

Among western Plains Indians, where hides were plentiful and bark was not, it was customary to dig a pit in the ground, press into it a buffalo or other hide, then fill this with water. Catlin, who saw the process among the Assiniboins (or Stone-Boilers) in the Yellowstone in 1832, tells us that "The meat is then put in . . . and in a fire which is built nearby, several large stones are heated to a white heat, which are successively dipped and held in the water until the meat is boiled." He calls it "a singular and peculiar custom." James L. Lang, edited and interpreted by Michael S. Kennedy, in a recent work on this tribe, gave the dimensions of such a hole as 18″ x 12″. Old men who told the tale said that five rocks, "larger than a fist," slipped in one at a time, by means of a buffalo shoulder, did the trick. With the fourth the water boiled; the fifth cooked the meat; the animals' blood added to the water, with two more stones, provided a soup. In later times, however, this method was used only by hunters absent from home.

Washington State and Oregon Indians, Wissler states, cooked acorns and salmon by dropping hot stones into boxes, which John D. Hunter, in his "Captivity," called wooden troughs; and into waterproof baskets. Such baskets were also made by New England Indians.

The Tlingit and Sitka Indians of Alaska combined two practices by lowering baskets into holes dug in the earth. These baskets, says Wissler, had delicate walls, and so were banked with stones. Five heated stones — note the use of the same number above—did the cooking. Writing 60 years

ago, Frederick S. Dellenbaugh in "The North Americans of Yesterday," mentions that wicker "jugs," as he called them, with mouths wide enough to receive large stones, were "still in use by some primitive peoples." He considered that "the effort to protect the basketry from the effects of heat had led to coatings of mud and clay and thus to pottery." The Zuni and Navaho words for pottery, cooking basket and mud basket respectively, appeared to confirm this, he believed. [Evidence of this pottery source is lacking in New England—Ed.]

George Wharton James "had the pleasure of eating delicious green corn mush cooked in this ancient fashion" (the boiling basket) among the Havasupais of Northern Arizona in 1899. "One of these baskets (shown in a cut) . . . "is bottle shaped, with two loops, from which depends a rawhide strap handle." When the basket was almost completed, "it is covered with red ochre and some slightly oleaginous substance. Then it is covered inside and out with pinion gum and thus becomes watertight . . . and will endure all kinds of hardships."

The Apaches boiled cornmeal mush in flat wicker baskets in 1870, by dropping hot stones into the cereal with wooden tongs. They parched corn in baskets, also, by inserting hot stones or even live coals amongst the grain. A corn meal, dried fish meal, berries and roots all received the hot stone boiling treatment on the Pacific Coast.

From all this and other evidence it becomes clear that boiling liquids and cooking food by means of heated stones has been a practice all across this continent. How long it has been going on is not known. Wissler, who believed it was confined to the West Coast before Columbus, thought it must have taken primitive man some thousands of years even to learn it; and we have seen that the practice has persisted down to the twentieth century.

So we come back to our question at the beginning. If the aborigines of the Northeast universally heated stones to generate their vapor baths; if one tribe, at least, baked beans with hot stones, and steamed clams by that method; if there existed a tradition as to the successful use of heated stones in boiling water; may it not be anticipated that somewhere, sometime, some informed and imaginative archaeologist will come upon evidence that will have a definite bearing upon the subject?

At any rate, let us examine any stones on or near habitation sites with sharp eyes and an open mind. If it happened in Maine, according to tradition, why not in southern New England?

Wayland, Mass.
May 25, 1962

STONE WORKING: FRACTURING OR CHIPPING

Charles R. McGimsey III

Courtesy, Arkansas Archaeological Society; News Letter, Vol. 2, No. 7, September, 1961 — all illustrations adapted from Ellis, Holmes, and Moorehead.

In selecting a stone to work into an arrowhead, or other chipped stone tool, the primitive craftsman was careful to choose flint or a stone of similar composition, which possessed the property of conchoidal fracture. Unless a stone has this quality, at least to some degree, it cannot satisfactorily be chipped into a preconceived usable form. Once a suitable stone has been selected, the craftsman can chip and shape it by either of two basic techniques: percussion, that is by striking the stone with another stone or other suitable tool, or by pressure, that is by applying pressure to a thin edge of the stone until a small chip breaks away.

CHIPPING BY PERCUSSION

A number of different techniques may be employed in chipping by percussion, and probably all were employed at one time or another by primitive craftsmen. The percussion technique can be utilized in fashioning a stone tool from the quarry to the finished product. In contrast, the pressure technique can only be employed to fracture relatively small cores and in working down flakes once they have been removed by other means. Very often, quarrying and rough shaping of chipped stone tools would be by percussion, while the final shaping

would be accomplished by pressure techniques; to be described in a later paper to follow.

The methods employed in chipping by percussion can be grouped under three general headings: striking, direct percussion, and indirect percussion techniques.

STRIKING TECHNIQUE. This method involves grasping the cobble or flake to be shaped in one or both hands and then striking it or even throwing it against a large stationary stone called an anvilstone (Fig. 15). This is undoubtedly the simplest method of percussion flaking and was probably used for some purposes almost universally. It is extremely difficult to control the direction and position of the resulting fractures when working with heavy stones, and, in the case of smaller pieces,

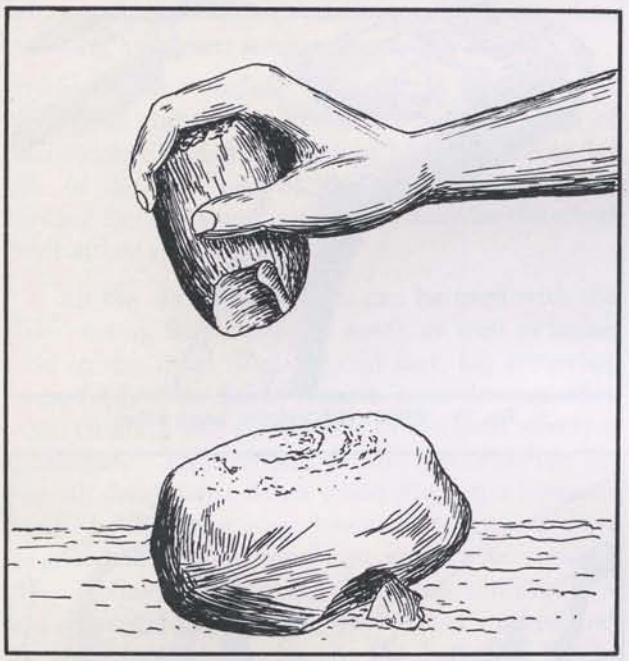

Fig. 15. DIRECT PERCUSSION, (on anvil).

accuracy and adequate force become difficult to achieve. It is unlikely that this technique was ever used for finer shaping. Its logical use would be in quarrying and in preliminary breakage, rather than in shaping a flake into a tool.

DIRECT PERCUSSION. This was probably the most widely used percussion technique. The method is one in which the stone to be worked is held in one hand or laid against a fixed object (anvil), and is then struck with a tool held in the other hand. This tool can be either a hammerstone, a hafted stone hammer, a wooden billet (heavy stick), or a bone (or antler) hammer.

The force of the blow delivered to the flake or stone is downward and away from the object, that is, a sweeping outward blow with the chip being detached from the under side as illustrated (Fig. 16). The technique has been observed in use on a number of occasions. O. T. Mason reports in 1895: " . . . both Indians and white men pound a small piece of jasper into excellent shape for an arrowhead with a small pebble of quartz alone . . . To effect this, take a thin chip of any conchoidal stone between the left thumb and forefinger. With an elongated pebble of hard stone strike a series of quick, light, elastic blows along one margin of the flake, barely touching it. The nearer one comes to missing the edge the better."

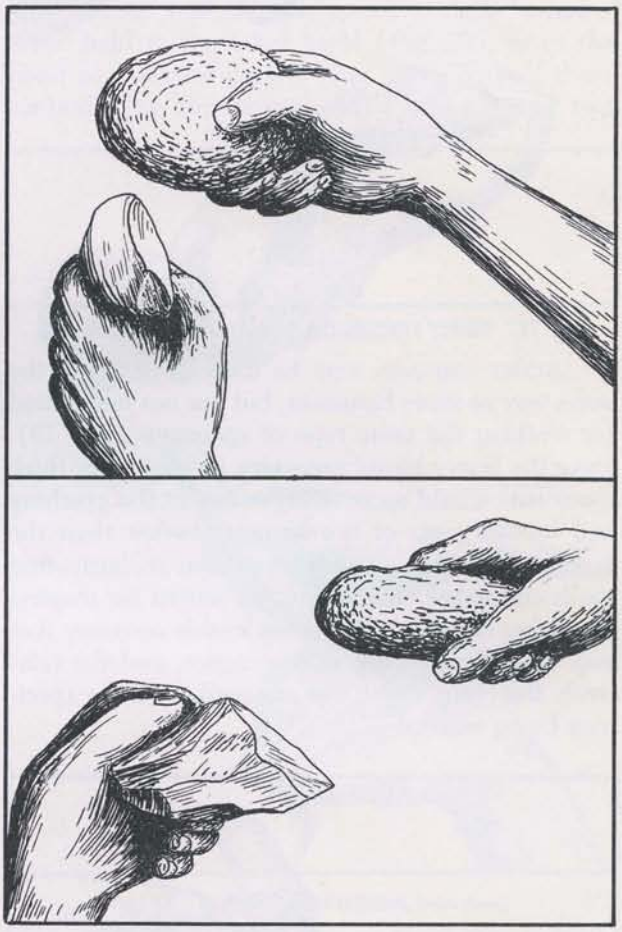

Fig. 16. DIRECT PERCUSSION, (using hammerstone).

Undesirable results of the use of the hammerstone are a battering effect on the edge of the flake being worked and the large number of hinge fractures that occur. Both of these faults can be in large part overcome during secondary shaping by pressure. Direct percussion chipping with a hammerstone is best employed for a rapid roughing out and shaping, or in supplementing more refined techniques, when thick edges are encountered, or when it is necessary to remove thick heavy bulbs of percussion.

The hafted stone hammer is also best suited to the above processes (Fig. 17). For easy use, the hammer cannot be very heavy, and the handle must

be held short for maximum accuracy. Much care is necessary to avoid breaking the piece being worked, since most of the force of the more or less crushing blows of the hammer is absorbed entirely by this piece, even when it is held in the hand. This method doubtless enjoyed wide popularity due to its simplicity, but care in its execution must be observed.

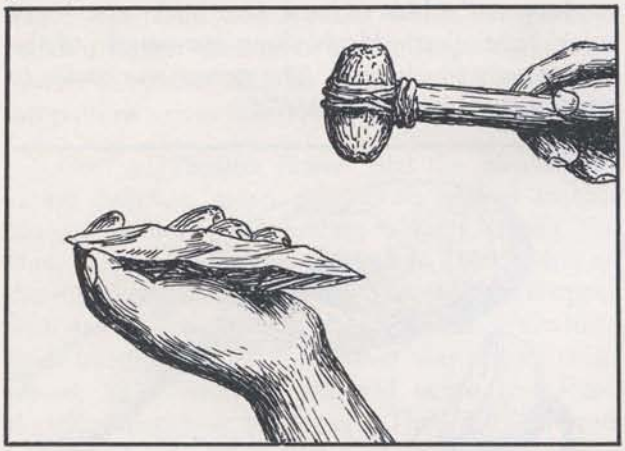

Fig. 17. DIRECT PERCUSSION, (using hafted stone hammer).

Antler hammers may be used in precisely the same way as stone hammers, but are not best suited for working the same type of specimen (Fig. 18). Since the heavy blows necessary to work very thick specimens would more likely result in the crushing and breaking up of the hammer rather than the specimen, its use must be restricted to fairly thin spalls and flakes. It is admirably suited for shaping thin flakes because of the considerable accuracy that may be obtained after some practice, and the relatively flat chips which are removed from the specimen being worked.

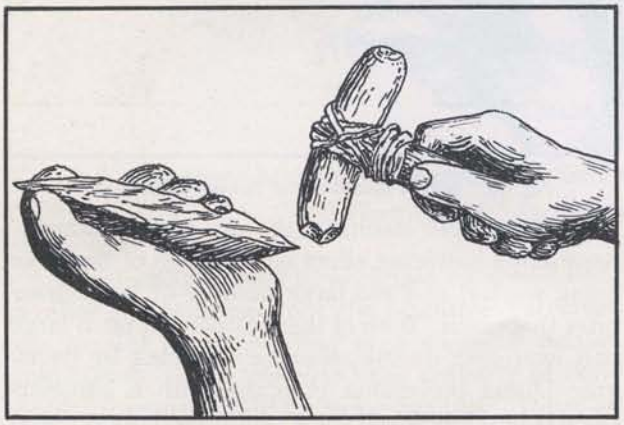

Fig. 18. DIRECT PERCUSSION, (using hafted antler).

A wooden billet or club may well have been used by the Indian in fashioning his stone tools, though as yet there is not adequate proof that it was used (Fig. 19). Ellis, in more recent times, experimented with this technique and described it as follows: "The . . . flint is held in the . . . left hand; if a large piece, it is supported mainly by the index and middle fingers holding it against the palm with the thumb on top; if a small piece, it is held flat in the palm mainly by the middle and fourth fingers, the palm facing upward. In either case the blow is struck downward with the club held in the right hand, the forearm and wrist supplying the force. There is, however, this difference: in the case of a fairly large specimen where the thumb is on

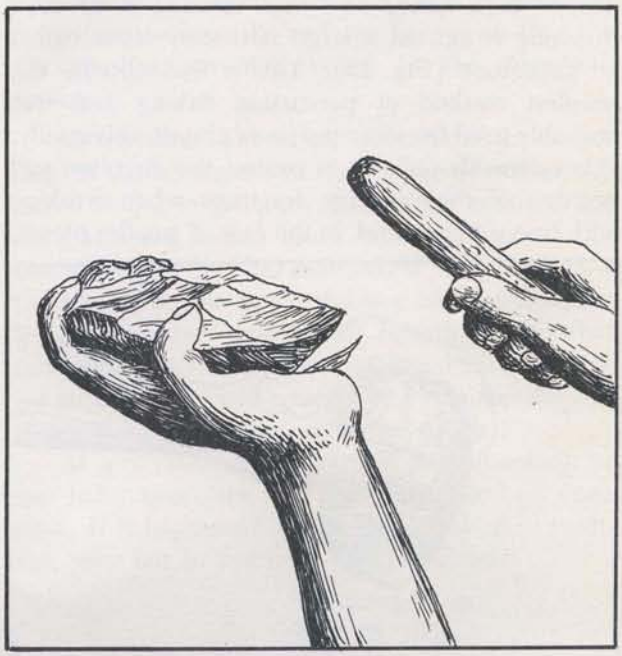

Fig. 19. DIRECT PERCUSSION, (using billet).

Fig. 20. DIRECT PERCUSSION, (flatwise on anvil).

top, the blow is a follow through blow, since there is nothing to impede the passage other than the flint; in the case of a small specimen, the blow is of necessity interrupted, since the club is striking directly into the palm of the hand. In both cases, the objective material is held in a horizontal position, and the force is applied in a slight arc that

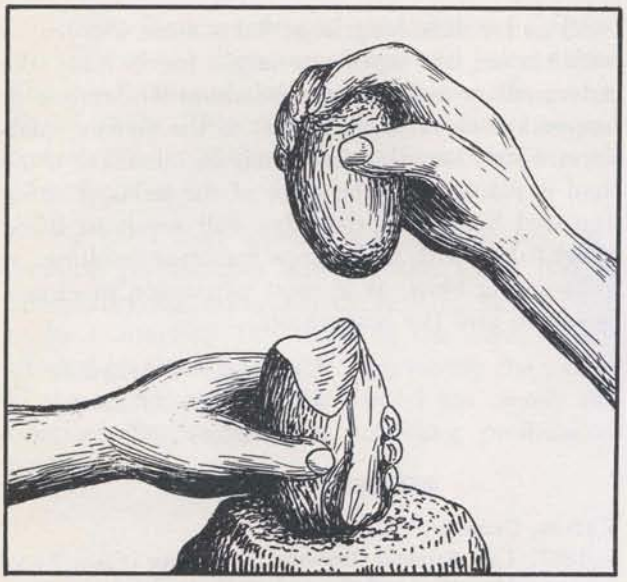

Fig. 21. DIRECT PERCUSSION, (edgewise on anvil).

strikes the flat surface virtually at right angles. When the club comes in contact with the edge of the objective flint, a chip is detached from the under side of the flint, and by the simple expedient of turning the specimen over, chips may be detached from either side as desired."

All the above techniques can be used with the flake resting flatwise on an anvil, as well as being held in the hand (Fig. 20). In fact, for removing large fairly thin flakes from a core the use of a stone hammer and anvil is one of the most effective techniques. This method is also effective for removing deep, wide flakes when shaping a piece of stone. In the latter case, however, great care must be taken to prevent breakage, and for this reason other techniques are preferable. The addition of a pad of leather between the piece being worked and the anvilstone greatly lessens the danger of breakage. The flake or cobble to be worked may also be placed edgewise on the anvil, the upper edge then being struck (Fig. 21). This latter procedure can be used to greatest advantage in thinning down and roughing out artifacts from raw material.

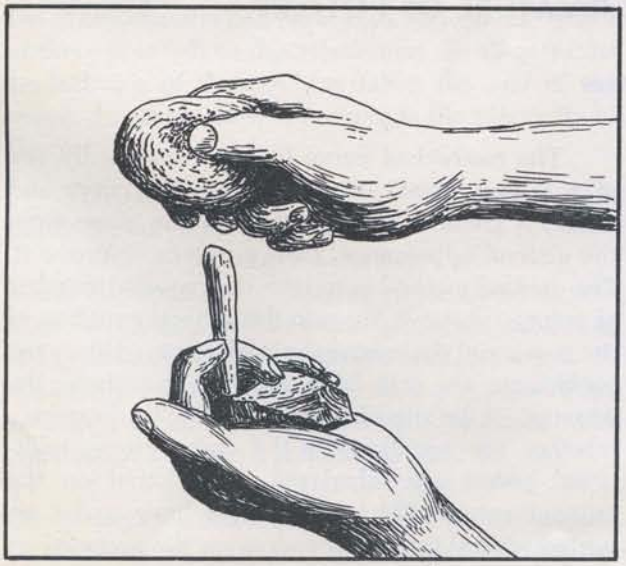

Fig. 22. INDIRECT PERCUSSION, (one man).

INDIRECT PERCUSSION. This is the third general class of percussion techniques. For this the flint being shaped is held at rest either in the hand or on an anvil, while an intermediate tool, such as an antler tine, is placed on the edge of the material at the point where a chip is to be detached. The intermediate tool is then struck with a hammerstone held in the other hand (Fig. 22), or in the hand of a second person (Fig. 23). Both of these methods give the same result, but the use of two

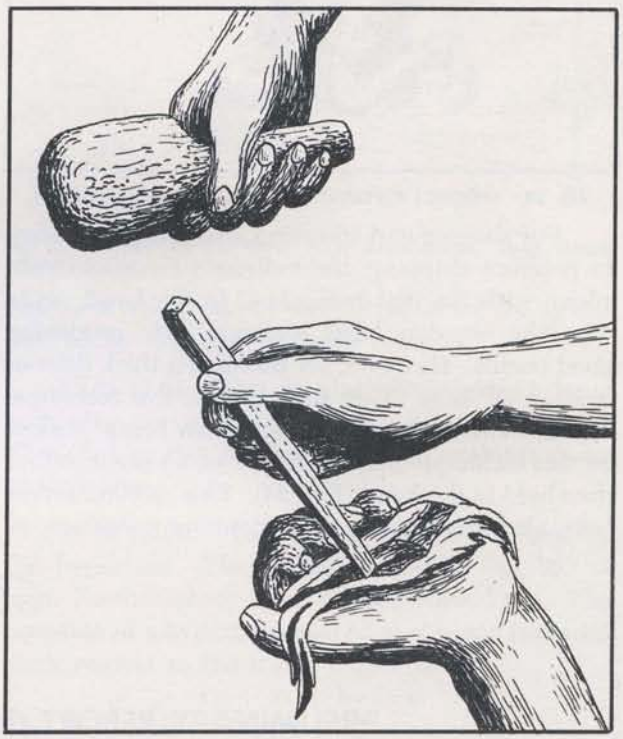

Fig. 23. INDIRECT PERCUSSION, (two men).

persons permits much faster work, since the punch can be shifted almost as rapidly as the blows can be given. Catlin in 1867 witnessed and described this latter technique: "The master workman, seated on the ground, lays one of these flakes on the palm of his left hand, holding it firmly down with two or more fingers of the same hand, and with his right hand, between the thumb and two forefingers, places his chisel (or punch) on the point that is to be broken off, and a co-operator (a striker) sitting in front of him, with a mallet strikes the chisel (or punch) on the upper end, flaking the flint off on the under side, below each projecting point that is struck. The flint is then turned and chipped in the same manner from the opposite side, and so turned and chipped until the required shape and dimen-

sions are obtained, all the fractures being made on the palm of the hand . . . This operation is very curious, both the holder and the striker singing, and the strokes of the mallet given exactly in time with the music, with a sharp rebounding blow, in which, the Indians tell us, is the great medicine (or mystery) of the operation."

Fig. 24. INDIRECT PERCUSSION, (one man working on anvil).

For shaping and trimming artifacts preliminary to pressure chipping, the indirect percussion technique with the flint being held in the hand, ranks with the wooden billet technique for producing good results. However, for thinning a thick flake or striking off large flakes from a core, this technique is not at all satisfactory. A specimen being worked by this technique may be rested on an anvil, rather than held in the hand (Fig. 24). This method serves best, also, for shaping and trimming processes, as well as for detaching large flakes from a core. In either case, the optimum angle for holding the intermediary tool seems to be about 90 degrees, or approximately at right angles to the striking platform. Fairly long thin flakes may be detached, if the tool is placed near the edge of the flake. Placing the tool back from the edge will result in thick, short flakes, with large hinge fractures resulting. A rebounding blow, as in most percussion processes, seems to give the best results.

University of Arkansas
Fayetteville, Arkansas
September, 1961

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PRELIMINARY REPORT OF THE CURVATURE OF POTTERY

Melvin V. Landon

In a previous paper I discussed the determination of the diameter of a pot as determined from a sherd[1]. In this paper, I propose to tackle the considerably more difficult task of analyzing the contour of the pot in the vertical plane. At first glance it would seem that this would be impossible, for, although archaeologists speak loosely of ellipsoidal, paraboloidal and hyperboloidal pots, so far as I have been able to determine, those are loose descriptive terms and not based on mathematical analysis. As far as we know the Indians knew nothing of the theoretical properties of these curves. However, I went ahead with the analysis of the pots with surprising results.

The method of curve fitting is essentially one of trial and error.[2] One examines the curve and makes a guess as to the nature of the curve from the general appearance, then proceeds to prove it. The general method is to take the required number of points, substitute them in the general equation of the curve and determine the coefficients. When the coefficients are put back into the equation, the equation of the specific curve results. To determine whether the equation fits the entire curve, additional points are calculated and plotted on the original curve. This process may have to be repeated several times, depending on the accuracy of the original guess.

When the curve is suspected of being a circle, it is sufficient to draw two chords and bisect them. The intersection of the bisectors is then the center of the circle. This method is to be found in any geometry text or in the previously mentioned article. (See footnote 1)

So far I have worked with unretouched, uncropped photographs only; at this stage that is satisfactory, but eventually the actual pots will have to be examined. The shape of the curve is not affected by the reduction in size, merely the values of the coefficients. At this point I am merely developing the method and reporting preliminary results.

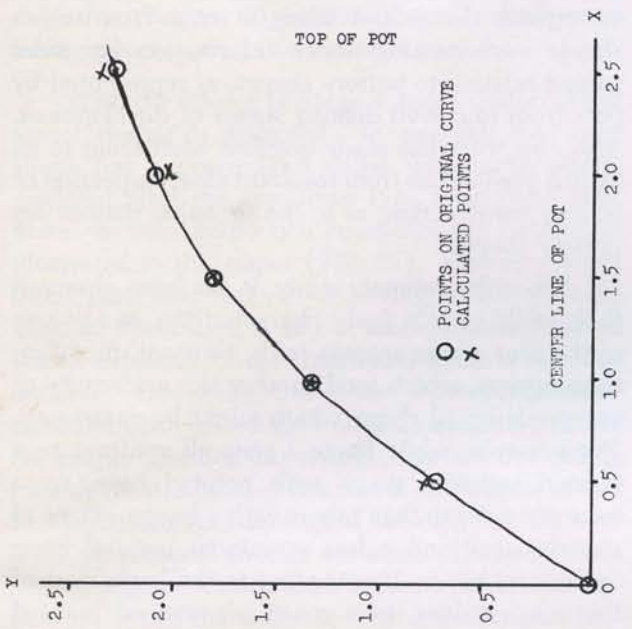

Fig. 25. STAGE I POT, from Middleboro, Mass.

I am indebted to Bernard Powell of Norwalk, Connecticut for excellent photographs of pots from the Massachusetts and New York State areas. Three of these pots will be described here. In all cases the central axis of the pot was taken the axis of the curve. In other words, the curve is the silhouette of the pot.

STAGE I. This pottery is characterized by a parabolic curve of the form

$$y = ax^2 + bx + c$$

where the constant "c" may be made equal to zero if the vertex is placed at the origin, with the axis of the parabola coinciding with the axis of the pot. In the example shown (Fig. 25), the x and y scales are arbitrary, as are the scales of all the diagrams. The equation of this curve is found to be

$$y = -0.30x^2 + 1.68x$$

The points calculated from this formula are plotted on the original curve and fit to within 3½% for the worse fitting point. The lower part of the pot only has been analyzed, as the curvature of the upper part is too slight for accurate analysis.

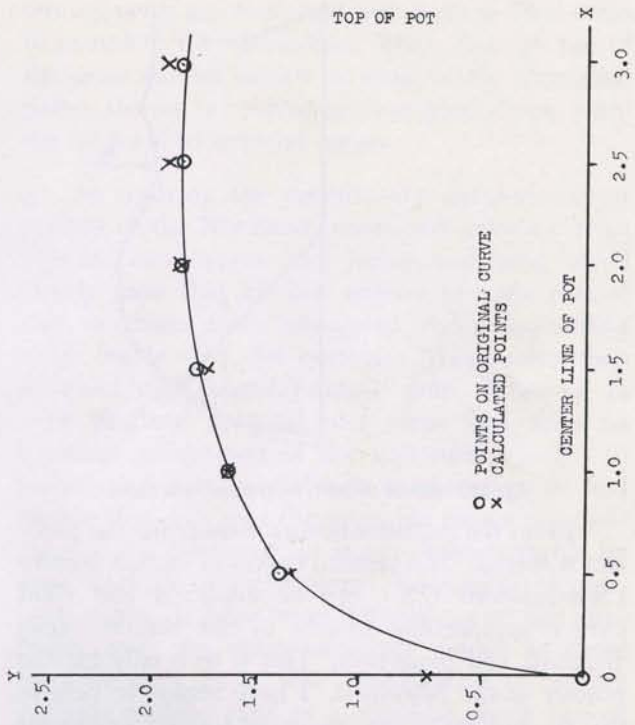

Fig. 26. STAGE III POTTERY, from Easthampton, Long Island, New York.

STAGE II. This is also characterized by a parabolic curve and is essentially the same as STAGE I in this respect, hence no example is included here.

STAGE III. This pottery is characterized by the hyperbola. The example shown (Fig. 26) is from Easthampton, Long Island, New York. The equation of a hyperbola, placed as this one is placed with respect to the x and y axis, is

$$xy + ax + by = c$$

This particular pot has the equation

$$xy - 2.33x + 0.827y = 0.63$$

or

$$y = (0.63 + 2.33x)/(x + 0.872)$$

The equation gives good agreement except for $x = 0$. There may be two reasons for this. First, mathematically, the curve here has a large slope, hence a small error in x would make a large error in y. The second reason is that the bottom of the pot may be deformed by the amount of the error.

STAGE IV. This is characterized by a spherical base (Fig. 27). While the circular cross section can be analyzed by analytical geometry, the more simple geometrical treatment is quicker and yields the same results. The body of the pot is found to consist of a compound curve with two centers and two radii as shown. The deforming of the bottom of the pot causes it to depart from the true circle, as shown by the dotted line.

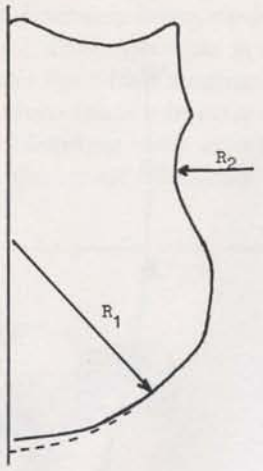

Fig. 27. STAGE IV POT, from New York State.

From the mathematician's standpoint the problem is solved. The vertical curves of Indian pottery (Northeastern U.S.) can be analyzed and yield curves approaching closely to the simple circle, parabola and hyperbola. This is true only for the pottery of the Northeast. I have reason to believe that the Indians of the Southwest formed a different curve or curves.

The mathematical solution of the problem of the vertical curve of pottery brings more problems than it solves. Most of these problems are out of the ken of the scientist or the archaeologist as such.

1) Can this be of practical use in restoring pottery? This is a problem in restoration techniques.

2) Why do we find simple curves, made by a primitive people who presumably knew nothing of the properties of these curves? The term "simple curves" is misleading. It merely means that these curves are relatively simple. They are conic sections and have simple equations. The circle and the Archimedean spiral can be drawn mechanically with little knowledge of the curves themselves[3]. Not so the parabola or hyperbola. The Indians may have obtained these curves by imitating nature, i.e. animal bones, wasps' nests, other insects' nests and cysts. I believe that if further study were made along these lines, much insight would be gained into the process of pottery making by the Indians.

Nasson College
Springvale, Maine
June 28, 1962

[1]Landon, DETERMINATION OR DIMENSIONS FROM POTSHERDS, MAS Bult. April 1959.

[2]Landon, CURVE FITTING, The Mathematics Teacher, May 1960, p. 349.

[3]The Archimedean Spiral, while not a conic section, can be drawn without any detailed knowledge of the properties of the curve. Primitive people have used the conch shell to draw the spiral. A cord is wrapped around the convolutes, then unwound while drawing the spiral.

APPENDIX

Editor's Comment: Concerning the problem of how to determine by mathematical calculations the vertical contours of aboriginal ceramic pots of the Northeast — the subject of this paper — this comment applies in part only. It is offered more as a correlation, with intent to present another aspect of this interesting problem, one that has been gained from personal experience in the restoration of ceramic pots.

Over the past 15 years it has been the writer's privilege to restore 24 pots from this section of the country, as well as about 10 more from other regions. During the exacting labor of joining together contiguous sherds and filling in areas from which sherds were missing, much information has been gained relating to pottery shapes, as represented by pots from four well defined stages of development. Also, this work has made possible what seem to be logical evaluations from resultant close inspection of pottery construction, as to the probable reasons for pottery shapes.

From this intimate study, it has been observed that, while certain body characteristics in any one of the four stages remain fairly constant, modifications appear, which tend to alter the uniformity of any predesigned shape which might be envisioned. For example, while Stage 1 pots all conform to a general conoidal shape with pointed base, some have more depth than others with a longer extent of straight neck and a less prominent pointed base. Still others have a longer taper to the lower part of the pot, resulting in a more pronounced pointed base.

Stage 2 pots may have further modifications of the conoidal shape, which is also basic for this development stage. In the case of one such Rhode Island pot from the Potter Pond site, the base is sharply undercut, which reduces the pointed bottom to an almost unrecognizable extent. Another pot from Middleboro, Mass. is decidedly elongated, which completely alters the usual conoidal contours found in many Stage 2 pots. Still another pot of this period from Plymouth, Mass. departs from the usual straight neck and exhibits considerable constriction, which drastically upsets its conformity to an uninterrupted conoidal contour, besides causing the pointed base to be shallower and less conspicuous.

By the time Stage 3 pots emerged, the well established conoidal shape had begun to be less prominent, as it took on a more semi-globular form in some instances, but not in all. What was happening was that the basal point was becoming

rounded, or less pointed. In this development stage the vessel's shape seems to be in a flux with more and more variations creeping in. Besides an ever changing slope to the base with different degrees of a pointed bottom, the laminated collar appears for the first time. This produces a sharp constriction of neck just under it, which alters the general body contour. Toward the end of the period, presumably, a pressed-out collar occurs, which is attended by a deeper and wider constriction of neck. One specimen of this kind from Middleboro, Mass. has a semi-globular base, while another from the Indian Hill site in the same town has a sharply undercut conoidal base. These instances of variation should serve, it would seem, as convincing proof of the excessive changes in vessels' shapes, which were taking place during this Ceramic period.

With the advent of Stage 4, more uniformity in vessel design is apparent. In general, the basic shape has a pressed-out collar with castellations, modeled after the Iroquoian type from New York State. In most respects it resembles the contour as illustrated in this paper (Fig. 27). However, more often than not, instead of having a full globular base as illustrated, it has a semi-globular base in which evidence of the traditional point is still discernible. Obviously, this causes a steeper pitch to the basal contour, which would necessitate a different graph. Besides this change, the two Barnstable pots as illustrated and described in Bulletin of the Massachusetts Archaeological Society, Vol. 23, Nos. 3 & 4, present still another variation. They represent more elongated vessels with bulbous projections appearing under the collar at each castellation. Evidently, here is an aesthetic modification, which again would require a totally different graph to adequately describe it.

In the restoration of pots, an artistic eye has been found to be more useful in producing the probable contours of a pot, than a pre-designed drawing. That is to say, use of the same innate capabilities, as utilized by primitive potters, should, it has seemed, be able to produce similar results. In order to establish the shape of a broken pot, of which only a portion has been preserved, it is first necessary to glue together as many contiguous sherds as possible. Not until enough segments from different parts of the pot have been restored in this way, should restoration of the entire pot be attempted. For an ideal restoration there should be enough contiguous sections available from rim to bottom to enable a trained eye to project their contours over the areas where sherds are missing. Then, with special dental cement, such as "Castone", missing sections are filled in. In this way, contiguous segments are combined with cement-filled areas to complete the restoration. Thus, through use of the same natural talents as those of the aboriginal potter, the pot is restored to its original shape, without recourse to artificial means.

In studying the evolutionary development of pottery of the Northeast, excavated evidence from sites in Pennsylvania, New Jersey, and Long Island clearly show that the first artisans to make pots of clay in these areas attempted styles resembling stone bowls with flat bottoms. These were then followed with conoidal-shaped pots. However, in New England conoidal pots came first, with no evidence whatsoever of flat bottomed vessels. In considering this anomaly, it is necessary to first realize that Asia was the probable source for ceramics of the Northeast, as is now held probable by most students of archaeology. Knowledge of ceramics seems to have been diffused across the continent over the same migratory routes as those used by early man. The new method of making ceramic cooking pots in a conoidal shape moved all the way to the East, apparently without much alteration until it came up against the Stone Bowl Makers of Pennsylvania. Their soapstone quarries in the Appalachians were the first to be encountered in the course of this diffusion. Here, this new shape met resistance from the well established Stone Bowl tradition, whose bowls had flat bottoms. As was to be expected in such cases, the old tradition won out, and the first ceramic pots in that area were copies of stone bowls. This traditional insistence persisted all the way through the Stone Bowl industrial coastal regions to Long Island. But there it would seem it finally ended; apparently, the experimental flat-bottomed shape had proven unsatisfactory, since it was replaced with the conoidal form. Consequently, when knowledge of ceramics was brought across the Sound into New England, its Stone Bowl Makers must have been dissuaded from attempting to make their ceramic pots with flat bottoms, since they adopted the conoidal shape for their first pots. Evidently, they were told that flat bottomed pots had been tried out, and had been found undesirable.

What finally caused this reluctant change to a conoidal form? While it will always be a matter of conjecture, the science of physics seems to provide a reasonable answer. It appears to be simply a problem of expansion and contraction of an object held over a hot fire. With a flat bottom the heat tends to be unevenly distributed, which in the case of a ceramic substance would probably produce a crack, after only a few exposures to heat. On the contrary, soapstone, as used for stone bowls, has

exceptionally good heat-absorbing properties, and therefore is not susceptible to cracking from uneven expansion. However, in the case of a conoidal ceramic vessel the situation is different. With the pointed end sunk into the hot embers of the fire, heat would tend to be more evenly distributed, uniformly enveloping the periphery of the pot, and, covering a larger area would bring the pot's contents to a boil more quickly. Cobblestones were placed around the pot, which helped keep it in an upright position. Hence, if this chain of reasoning is valid, it is quite understandable how the ceramic conoidal shape finally emerged the winner over a flat-bottomed style, as previously used for stone bowls in the Northeast.

From this, it seems evident that in devising pottery shapes potters followed the basic conoidal form, which probably had been diffused from Asia, because by trial and error it was found more durable in withstanding the heat of the fire. Various alterations over the years never completely displaced it, and even Stage 4 pots, with semi-globular bottoms, appear to have been set in the burning embers rather than supported over the fire from a tripod, although their deeply constricted necks might suggest the latter. Evidently, certain modifications, like the laminated collar of some Stage 3 pots, were intended to increase the pot's durability, while others were intended to improve its aesthetic characteristics. The bulbous protrusions of the two Barnstable pots would doubtless fall in the latter category.

EDITORIAL

METHODS OF EXCAVATING AND RECORDING

Members frequently ask for information about how to go about excavating a site. It is gratifying to hear from such inquirers, since it indicates a desire on the part of many to learn more through controlled excavation than may be found out through merely the accumulation of collections, and a study of artifact traits.

In Volume 22, No. 1 we ran an editorial on page 16 carefully setting forth field procedure, in which general excavating directions were outlined. Also, from time to time, there have appeared reports of sites excavated by members, in which information was recorded indicating procedural methods used to uncover the site's artifacts.

A brief review, at this time may be opportune, of certain accepted methods recommended for use in excavation: 1) Secure permission to excavate from the site's owner. 2) Stake out a limited area as a test in 5 or 6 ft. grids from a base line. 3) Identify squares by numbers numerically arranged in one direction, and by letters alphabetically arranged in the other. 4) Dig a trench through subsoil across the front of one square to get started. 5) Remove turf from a 15" bench in the square along the trench. 6) Scrape down the bench with a straight edged trowel, or small garden hoe with handle sawed off. 7) When artifact appears, take vertical measures from artifact to top of ground, and from artifact to junction (where loam meets subsoil). 8) Record these measures on a 4 x 6" card or paper (Fig. 28), noting in which soil zone the artifact was found, loam, junction, or subsoil. 9) Indicate, also on field cards by X approximate location of find in square, identifying the square by number-letter limits. 10) Note disturbances and associated features, if any. 11) By drawing around artifact, make an outline drawing of it on card. 12) Number each record card numerically, and mark artifacts that apply with corresponding numbers in India Ink.

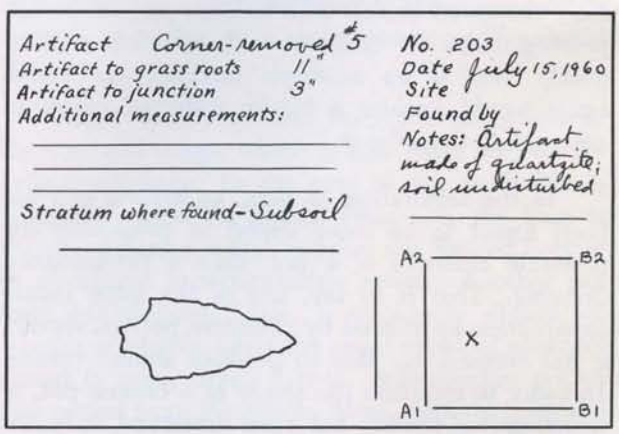

Fig. 28. Suggested 4" x 6" form, showing method of recording an artifact. It may be printed or not, as desired.

In order to correlate and study excavated evidence as the work progresses, it is important to transfer data from field records to a master chart, based on vertical measures. This serves as a running account for accumulating evidence, and helps locate culture zones before work progresses too far. This chart may be ruled in on any convenient sized paper, large enough to accommodate number of

ARTIFACTS	VERTICAL POSITIONS OF RECOVERED ARTIFACTS — ABOVE 5"	4"	3"	2"	1"	JUNCTION	BELOW 1"	2"	3"	4"	5"	6"	TOTALS
Cor-removed #7					2		7 2						9
Cor-removed #5							1	2	7 2		1		11
Cor-removed #8								1	4	5	2		12
Cor-removed #9								3	5	3	1		12
Eared				1	1		4						6
Side-notched		2	1	3	5		3						14
Grooved Ax					1		2						3
etc.													

Fig. 29. SAMPLE MASTER CHART.

artifacts anticipated, with measures taken in inches to the nearest inch, as is recommended (Fig. 29). Each entry is recorded by a single short mark, with totals at completion of dig appearing in right hand column. Usually, one inch each side of junction may be considered together as junction area, since junction delineation tends to be irregular and wavy, when not disturbed by the plow, however, in that event it is clear-cut. If site in the past has been plowed to the junction, then all artifacts found in loam are considered disturbed with no significance being attached to their vertical positions. In this event, only the vertical positions of those artifacts located in the subsoil become important as culture zone determinants. Sample listings are shown in the chart, from which it will be noted that Corner-removed #7, Side-notched, Eared points, and Grooved ax traits occur near junction (Late Archaic), while Corner-removed #5,8,9 traits occur below in subsoil (Early Archaic). Some may appear disturbed and out of place, but averaging entire recoveries of each should place concentration below that portion, which is out of place. In such plowed sites, the Ceramic culture would be found disturbed, scattered throughout loam, with an admixture of Late Archaic picked up by the plow at junction. Culture distribution, as shown in Figure 29 is merely a sample of one site possibility to illustrate method of analysis. Other distributions are possible, although culture sequence should remain the same, depending upon the amount of overburden accumulation at any given site.